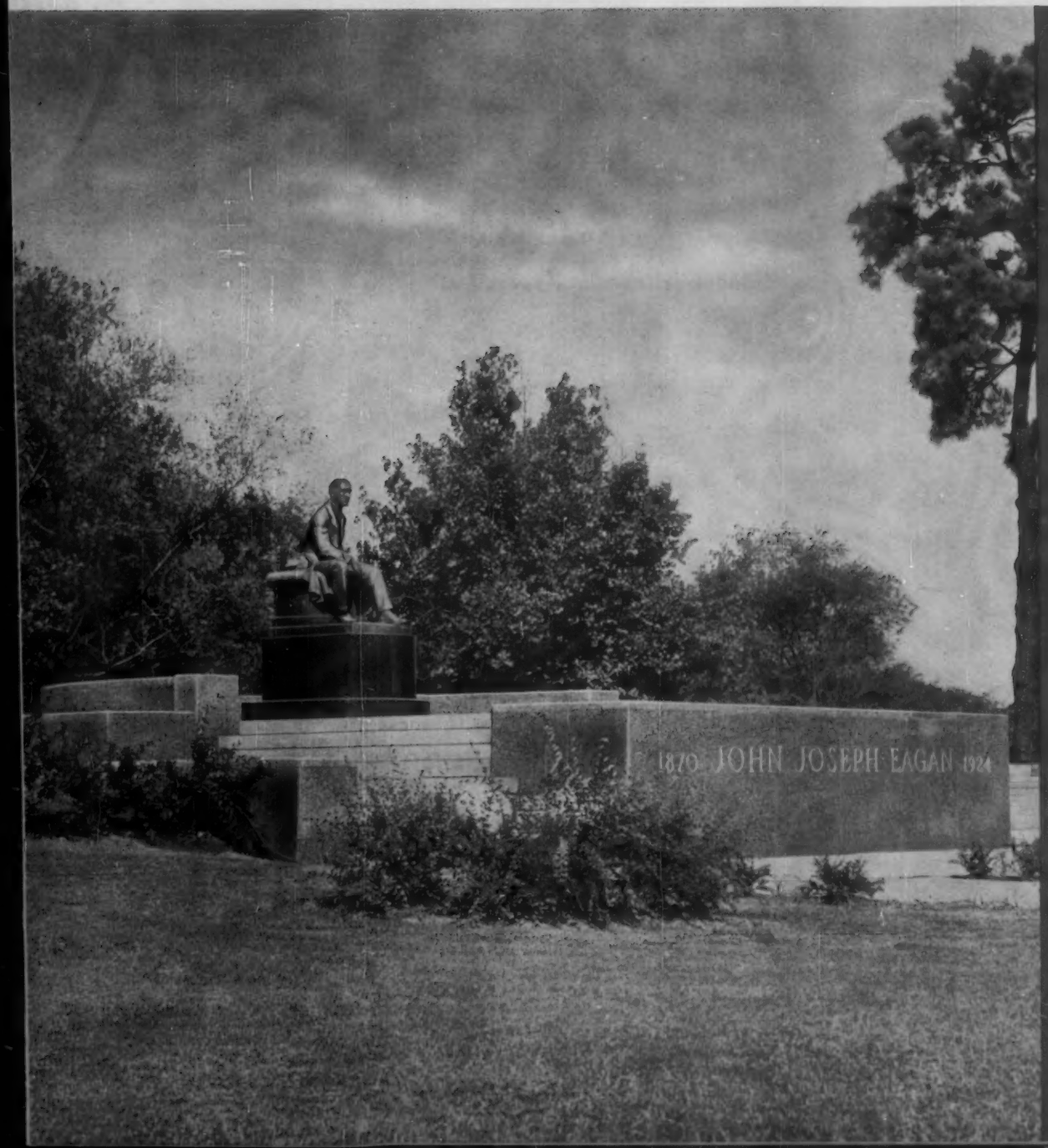
MARCH, 1956

modern castings



Owned by THE MEN WHO BUY

"We Mechanized Anyway"
Everybody told small brass shop it couldn't be done—but they did!

Taming the Sprue
There's a lot we don't know about gating. Scientists seek new principles

Better Green Core Test
Ability of green core to support overhang is basis for better impact test

How to Melt More Metal
One foundry increased production by faster cupola charging system

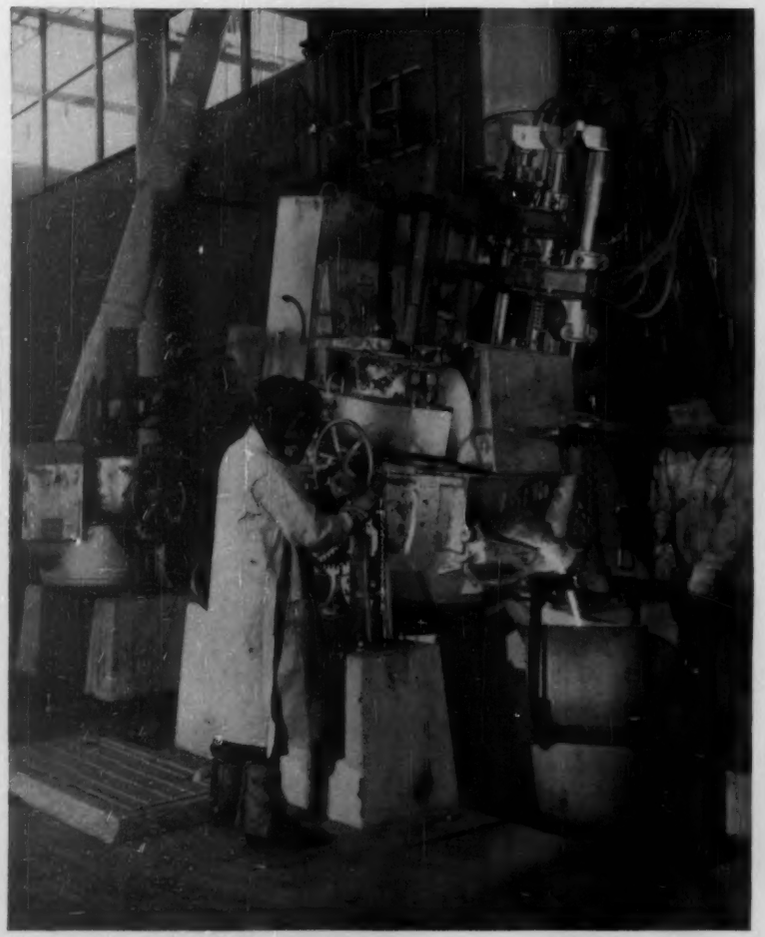
Gray Iron Contest
Six prize winners that cut production costs by better casting design

Cooperation in Tulsa
Management and labor cooperate to train apprentices in unusual program

Noise in Foundries
A flood of compensation claims for loss of hearing threatens management. Bonus Section tells why, and how to solve the problem.

FOUNDRY RESEARCH

includes Lectromelt* Furnaces when building for the future



RECOGNIZING the importance of the electric arc furnace to the modern iron and steel foundry, research laboratories now include them for help in developing methods and solving metal problems. The two Lectromelt Furnaces shown above are in such a foundry—small enough to expedite experiments, big enough to simulate production runs.

Lectromelt Furnaces give the exact control of heat and analyses needed to make today's engineered castings. With metallurgical research finding more and more uses for special alloy castings, specifications are tougher, yet a good foundry with a Lectromelt Furnace can meet these rigid requirements.

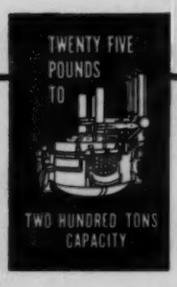
Our engineers will answer your questions covering all sizes of furnaces. Catalog No. 9-A describes them. For a copy, write Pittsburgh Lectromelt Furnace Corporation, 816 32nd Street, Pittsburgh 30, Pennsylvania.

Manufactured in. GERMANY: Friedrich Kocks GMBH, Dusseldorf...ENGLAND: Birlec, Ltd., Birmingham ...FRANCE: Stein et Roubaix, Paris... BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege... SPAIN: General Electrica Espanola, Bilbao...ITALY: Forni Stein, Genoa. JAPAN: Daido Steel Co., Ltd., Nagoya

*REG. T. M. U. S. PAT. OFF

MOORE RAPID

WHEN YOU MELT... Lectromelt



CIRCLE NO. 89, PAGE 71-72

future meetings and exhibits

MARCH

2 . . Malleable Founders' Society, *Hotel Commodore, New York. Eastern Section Meeting.*

7-8 . . Foundry Educational Foundation, *Hotel Cleveland, Cleveland. College-Industry Conference.*

12-16 . . National Association of Corrosion Engineers, Hotel Statler, New York. 12th Annual Corrosion Conference & Show.

19-20 . . Steel Founders' Society of America, *Drake Hotel, Chicago. Annual Meeting*

19-23 . . American Society of Tool Engineers, *International Amphitheater, Chicago. Industrial Exposition and 24th Annual Convention.*

23 . . Malleable Founders' Society, *Drake Hotel, Chicago. Western Section Meeting.*

APRIL

3 . . Material Handling Institute, *Edgewater Beach Hotel, Chicago. Spring Meeting.*

12-13 . . Malleable Founders' Society, *Edgewater Beach Hotel, Chicago. Seventh Market Development Conference.*

18-19 . . Armour Research Foundation, Illinois Institute of Technology, *Hotel Sherman, Chicago. National Industrial Research Conference.*

27 . . Malleable Founders' Society, *Drake Hotel, Chicago. Western Section Meeting.*

MAY

3 . . Non-Ferrous Founders' Society, *Atlantic City, Annual Membership Meeting.*

3-9 . . American Foundrymen's Society, *Convention Hall, Atlantic City, N. J. 60th Annual Castings Congress and Show.*

4 . . American Association of Spectrographers, *Chicago. 7th Annual Conference.*

8-11 . . American Welding Society, *Buffalo. Spring Meeting & Fourth Welding and Allied Industry Exposition.*

10-11 . . Refractories Institute, *Grand Hotel, Point Clear, Ala. Annual Meeting.*

11 . . Malleable Founders' Society, *Hotel Commodore, New York. Eastern Section Meeting.*

20-23 . . Industrial Heating Equipment Association, *The Homestead, Hot Springs, Va., Spring Meeting.*

JUNE

4-8 . . American Foundrymen's Society, *LaSalle Hotel, Chicago. Technical Committee Week.*

5-8 . . Materials Handling Institute. *Public Auditorium, Cleveland. Materials Handling Exposition.*

6 . . American Foundrymen's Society, *LaSalle Hotel, Chicago. Technical Council.*

11-12 . . Malleable Founders' Society, *The Homestead, Hot Springs, Va. General Society Meeting.*

14-16 . . American Foundrymen's Society, *Kellog Center, Michigan State University, East Lansing, Mich. Education Seminar.*

17-22 . . American Society for Testing Materials, *Chalfonte-Haddon Hall, Atlantic City, N. J. 59th Annual Meeting.*

24-26 . . Alloy Casting Institute, *The Homestead, Hot Springs, Va. Annual Meeting.*

28-29 . . American Foundrymen's Society, *LaSalle Hotel, Chicago. 13th Annual Chapter Officers' Conference.*

SEPTEMBER

1-9 . . International Foundry Trades Fair and 23rd International Foundry Congress, *Dusseldorf, Germany. Hosts: Association of German Foundrymen, Industrial Association of the Foundry Industry, Foundry Machinery Trade Association, and Joint Association of German Metal Foundries.*

11-13 . . American Die Casting Institute, *Edgewater Beach Hotel, Chicago. Annual Meeting.*

17-21 . . Instrument Society of America, *New York Coliseum, New York. 11th Annual Instrument-Automation Conference & Exhibit.*

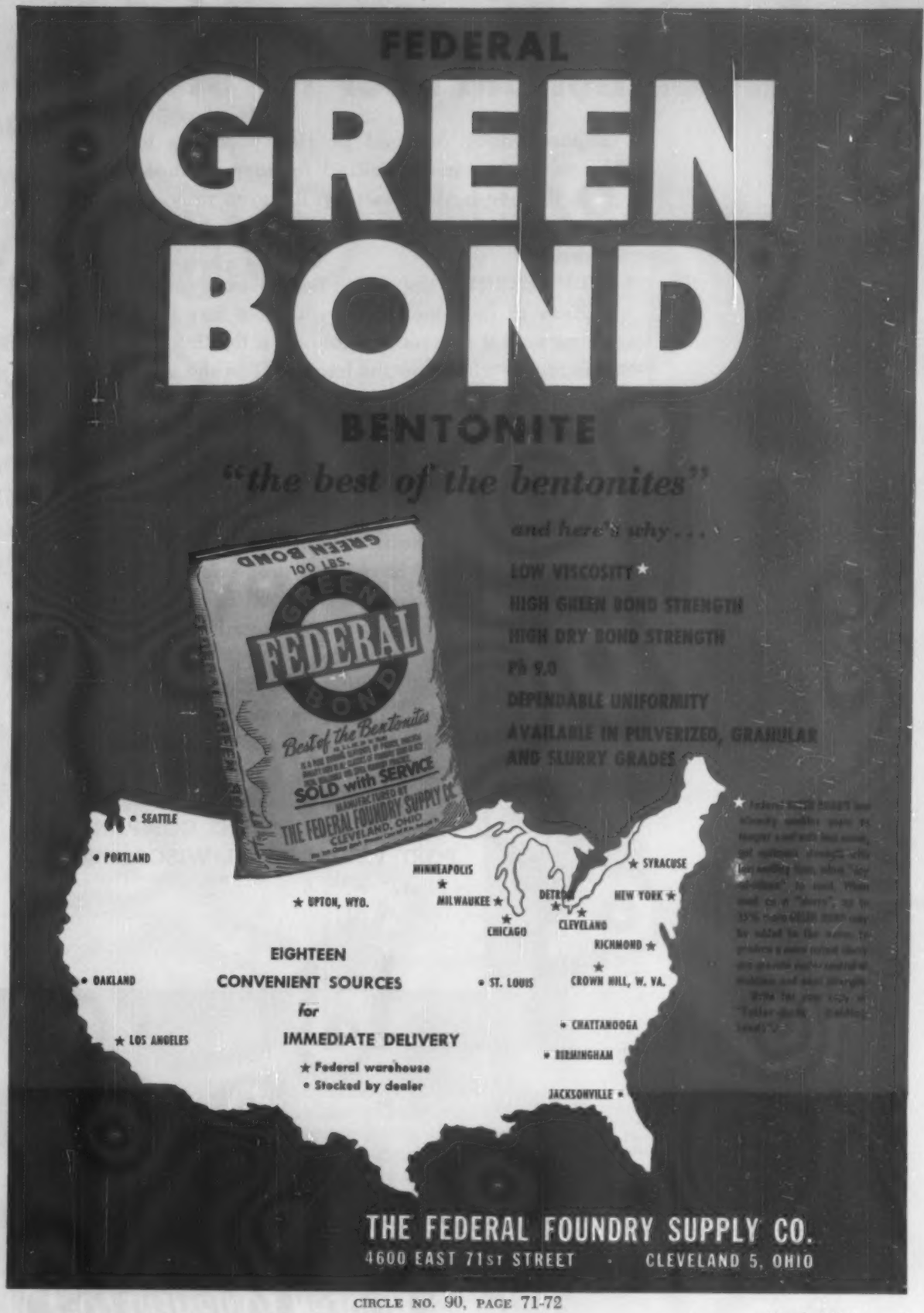
24-25 . . Steel Founders' Society of America, *The Greenbrier, White Sulphur Springs, W. Va. Fall Meeting.*

24-26 . . Material Handling Institute. *The Greenbrier, White Sulphur Springs, W. Va. Fall Meeting.*

OCTOBER

4-5 . . Magnesium Association, *Drake Hotel, Chicago. Annual Meeting.*

11-12 . . National Foundry Association,



CIRCLE NO. 90, PAGE 71-72

A 6" POT FOR BRASS... and this 6-Ton Bottom Pour for Steel..

impose vastly different pouring problems to challenge the best in specialized, foundry engineering...

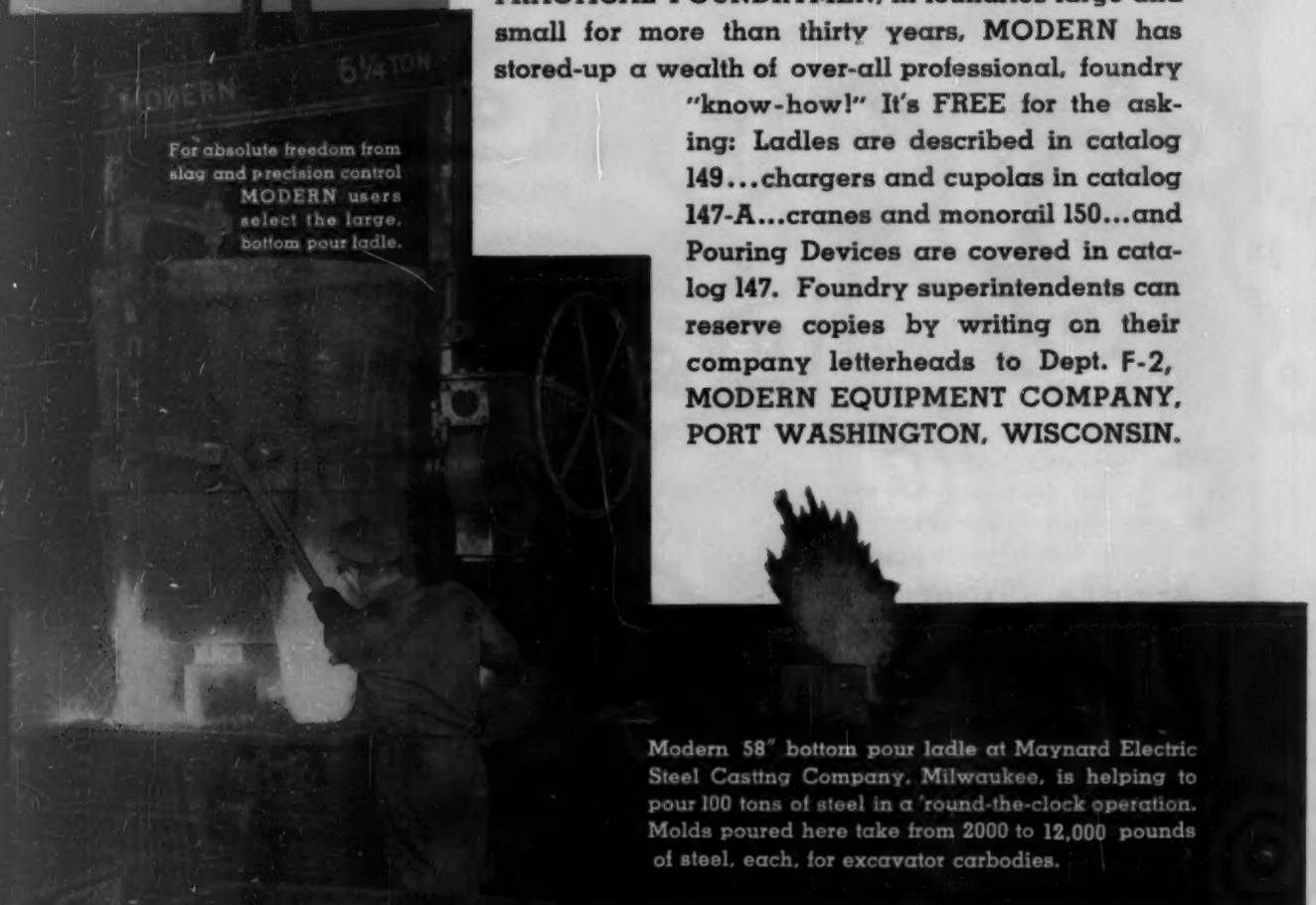
In the non-ferrous foundry, lining to prevent metal contamination is one of the superintendent's top worries.

DIFFERENT is the making of steel castings.

Here in the steel foundry almost any lining will serve well if contour is right and if the lining is thick enough to withstand the heat. BUT in the steel foundry over-all ladle balance and speed in slagging are the top-spot considerations. MODERN has some of the answers:

Through closely WORKING TOGETHER WITH PRACTICAL FOUNDRYMEN, in foundries large and small for more than thirty years, MODERN has stored-up a wealth of over-all professional, foundry "know-how!" It's FREE for the asking: Ladles are described in catalog 149...chargers and cupolas in catalog 147-A...cranes and monorail 150...and Pouring Devices are covered in catalog 147. Foundry superintendents can reserve copies by writing on their company letterheads to Dept. F-2, MODERN EQUIPMENT COMPANY, PORT WASHINGTON, WISCONSIN.

For absolute freedom from slag and precision control MODERN users select the large, bottom pour ladle.



Modern 58" bottom pour ladle at Maynard Electric Steel Casting Company, Milwaukee, is helping to pour 100 tons of steel in a 'round-the-clock operation. Molds poured here take from 2000 to 12,000 pounds of steel, each, for excavator carbodies.

MODERN EQUIPMENT CO.
PORT WASHINGTON, WISCONSIN

Detroit. Annual Meeting.

18-20 . . Foundry Equipment Manufacturers' Association, *The Greenbrier, White Sulphur Springs, W. Va. Annual Meeting.*

29-30 . . Refractories Institute, *The Homestead, Hot Springs, Va. Fall Meeting.*

30-Nov. 2 . . Gray Iron Founders' Society, *The Homestead, Hot Springs, Va. Annual Meeting.*

NOVEMBER

7-9 . . Steel Founders' Society of America, *Carter Hotel, Cleveland. Technical & Operating Conference.*

8-9 . . All-Canadian Foundry Conference, *Mount Royal Hotel, Montreal, Que. Sponsored by Eastern Canada and Ontario Chapters of the American Foundrymen's Society.*

'Bama Gets Casting Clinic

In cooperation with the Technical Department of the American Foundrymen's Society, the AFS Birmingham Chapter is sponsoring a Casting Clinic for the ferrous and non-ferrous castings industries in Alabama and adjoining areas.

The one-day meeting has been scheduled for Friday, March 16, at the University of Alabama. The program has been planned to assist operating foundrymen, metallurgists and technicians in the solution of technical problems according to Hans J. Heine, AFS technical director, who will conduct the clinic. Heine will be assisted by Prof. Warren C. Jeffery of the university.

There is no registration fee for the clinic and the number of representatives each foundry may send is not limited. AFS membership is not a prerequisite for attendance.

To insure adequate facilities for those attending the conference, Professor Jeffery requests that persons planning to attend notify him in advance. Write: Prof. Warren C. Jeffery, Dept. of Metallurgical Engineering, University of Alabama, P. O. Box 2035, University, Ala.

CIRCLE NO. 91, PAGE 71-72

march, 1956
vol. 29, no. 3

modern castings

in this issue

SECTION

How to Get the Most Out of the AFS Castings Congress 24
"It Couldn't Be Done!" But Small Brass Shop Mechanized Anyway / Vern Carlson 26
Cupola Charging Speeded / H. G. McCallum 30
More Revealing Green Core Test / E. C. Zuppann & H. Putz 34
Apprentice Training—How Labor and Management Cooperate in Tulsa / J. A. Dean 36
The Noise Problem in Foundries / AFS Noise Control Committee 37
Gray Iron Casting Design—Six Case Histories 53
Progress in Taming the Sprue / Goro Ohira 54

regular departments

Future Meetings & Exhibits .....Inside Front Cover
Modern Castings Album..... 4
Products & Processes..... 6
Pouring off the Heat..... 14
Talk of the Industry..... 17
Let's Get Personal..... 19
Foundry Facts—Crucible Melting 59
For the Asking..... 63
Foundry Trade News..... 69
Local Foundry News..... 78
AFS Chapter Meetings..... 82
Advertisers and Their Agencies 84
Classified Advertising 84
Obituaries 86

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AUDITED PAID CIRCULATION ABC

TIPS, TRENDS AND TECHNIQUES

The Golden Rule was the guiding influence in the life of John Joseph Eagan, founder and first president of famed American Cast Iron Pipe Co., whose likeness appears on our cover this month. This statue was dedicated to Mr. Eagan by the company's employees on the 50th anniversary of the firm's founding. At his death, Eagan was sole common stockholder in the company, and his will placed the stock in a perpetual trust that uses the dividends to supplement salaries and wages of all employees. The statue was conceived and paid for by contributions of employees. It was executed in Italy by Walker Hancock, noted American sculptor, and dedicated on April 22, 1955.

■ We have six big meetings on schedule next month, including the annual college-industry conference of the Foundry Educational Foundation. Don't miss out on up-coming events. Check *future meetings and exhibits* on the inside front cover.

■ Do you want an inexpensive gismo to classify casting finish? Or an automatic core blower? Or an abrasive to give an artistic finish to non-ferrous castings? If any of these items appeal to you, turn to page 6 where they are included in *products and processes.*

■ James Suttie, Martin A. Harder, Frank J. Koegler and D. H. Workman are just a few of the names listed in *let's get personal,* page 19. We would like to include your activities in this column too, so drop us a line.

■ Perhaps you will find your picture on page 78 as a part of *local foundry news.* This is the section that is devoted to news of local groups and this month it takes on a new appearance as it becomes a photo feature page. If your group isn't pictured, it soon will be. That's a promise.

■ Coming up . . . New life for old patterns . . . Jolt test for sands and molding machines . . . Permanent molds and shell molds team up . . . Methods engineering for the foundry supervisor . . . Gas and non-metallics in aluminum alloys.

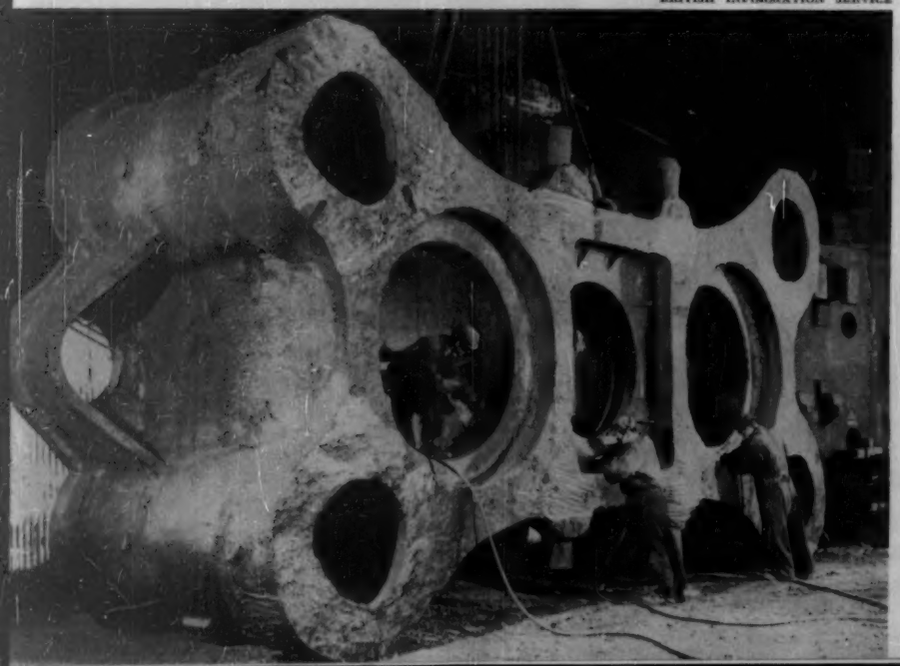
modern castings album

Midwest foundry and patternmaking teachers will hold seminar June 14-16 at MSU with AFS sponsorship.

H. C. Stirling of Blaw-Knox took rattle from AFS's Wm. Maloney to get Pittsburgh chapter under way.

MIT metallurgy students will benefit from $1000 gift made by the New England Foundrymen's group represented by H. B. Nye, left, and President A. M. Nutter.

BRITISH INFORMATION SERVICE



National Malleable sales v.p., H. L. Mausk, shows replicas of couplers from company's $100,000 display to a railroader attending a railway supply show.

MODERN RAILROADS PHOTO

Six furnaces were necessary to melt the steel for 166 ton forge press base cast by English Steel Corp. in Sheffield. 28' x 14' x 8' casting is a size record of the 100 year-old firm. Started to manufacture steel bells, the company now produces castings to 185 tons. A look-alike casting was produced recently by Lombard Corp., Youngstown, Ohio. A steel bridge laid across two flat cars was used to ship the piece to Los Angeles where it will be used as an extrusion press housing. Cars, bridge and casting totaled 333 tons.

MODERN RAILROADS PHOTO

Steel Founders to Hold 54th Annual Meeting

■ The Steel Founders' Society of America will hold its 54th annual meeting at the Drake Hotel, Chicago, March 18-20.

Besides transacting Society business, the meeting features an official look into the future, presentation of awards, and a special management session.

The tentative program is as follows:

Sunday, March 18

10:00 am .. BOARD OF DIRECTORS MEETING

6:30 am .. PAST PRESIDENT'S RECEPTION AND DINNER

Monday, March 19

8:30 am .. REGISTRATION

10:00 am .. SOCIETY SESSION
"We Audit Our Progress," A. J. McDonald, president.
"SFSA Finances," R. G. Parks, treasurer.
"The Trap or Triumph of the Future," F. Kermit Donaldson, executive vice president.
"Task Force in Operations," C. W. Briggs, technical & research director.
"Doors to the Market," G. K. Dreher, secretary.
Last three talks are subject matter for Discussion 66 session at 3 pm.

12:00 noon .. RECEPTION

12:30 pm .. LUNCHEON. Presentation of Technical & Operating Medal, Steel Foundry Facts Award, and special awards. Remarks by president-elect.

2:00 pm .. *"The Steam Turbine,"* (motion picture) an educational problem.

2:30 pm .. SOCIETY SESSION
"Remarks of Counsel," Chauncey Belknap.
"Discussion 66," Howard F. Park, Jr., moderator.

5:00 pm .. RECEPTION

Tuesday, March 20

9:00 am .. REGISTRATION

9:20 am .. *"The World That Nature Forgot"* (motion picture).

9:50 am .. MANAGEMENT SESSION
"Training Sales Engineers for Engineered Products," John Gammell, Allis-Chalmers Mfg. Co.
"Labor, the Government, and You," Lee C. Shaw, Seyfarth, Shaw & Fairweather.
"Have You Tried Listening?" Wesley Wiksell, Louisiana State University.

12:15 pm .. RECEPTION

12:45 pm .. LUNCHEON. *"Where are We Heading?"* Tom C. Campbell, editor-in-chief, *Iron Age*.

Buffalo Foundry Replaces Cast Iron Flasks with STERLING Rolled Steel Sections

Type illustrated is a Sterling Rolled Steel Channel Flask, Style "ASU", with single pin lugs and equipped with loop handles — one of the many Sterling Flasks now being used by this progressive Buffalo foundry.

Originally this foundry, one of many foundries operated by one Company, used cast iron flasks for producing castings. After years of research they discovered that Sterling Rolled Steel Channel Flasks help to produce quality castings at a lower cost per year. Today, more than 30,000 Sterling sections are currently rolling along the conveyor lines in most of their plants.

Sterlings are engineered and built for tough foundry service. They combine maximum strength with minimum weight. Each section forms a solid, rigid piece and is equipped with welded fittings. Sand flanges at top and bottom have fillets so that sand will pack under flanges. A heavy reinforcing rib is rolled in the center of each section to resist torsional and other strains. Flanged surfaces are machined to a close tolerance.

These are some of the Sterling features that assure accuracy and speed in molding, even under rough usage. Write for Catalog.

Sterling
WORLD WIDE SERVICE

STERLING WHEELBARROW COMPANY
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Subsidiary Company: STERLING FOUNDRY SPECIALTIES LTD.
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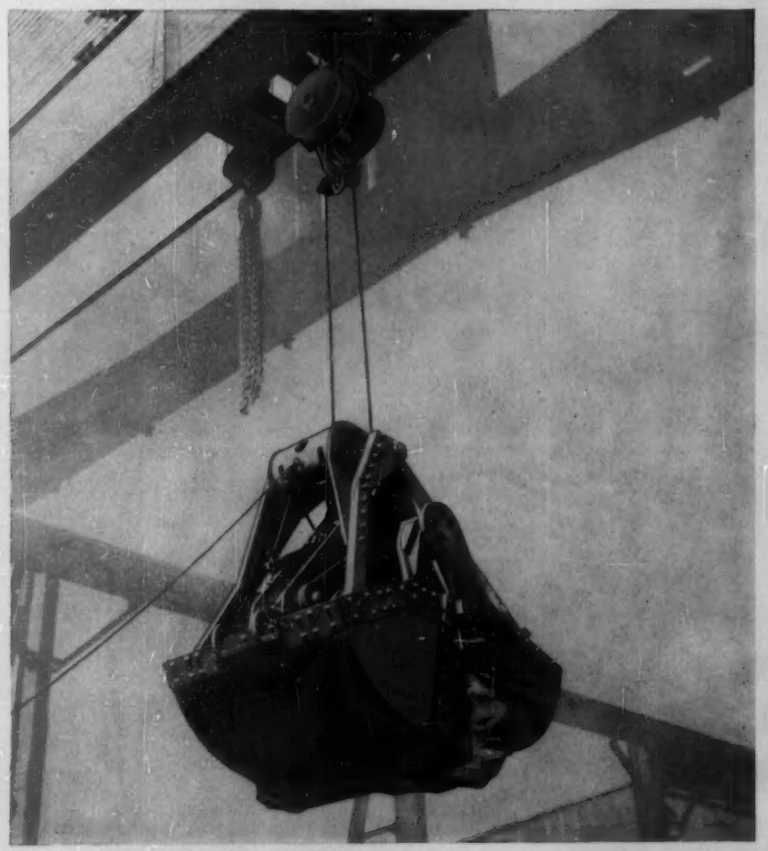
FOR NEARLY HALF A CENTURY *manufacturers of* FOUNDRY EQUIPMENT

CIRCLE NO. 42, PAGE 71-72

MORE WORK . . . FASTER!
WITH ERIE STRAYER
HOOK-ON CLAMSHELLS



CHECK these exclusive features:

- √ EASY HOOK-ON—no changeover problem. Versatile.
- √ COMPACT, RUGGED DESIGN—longer, tougher service.
- √ LIMITED HEADROOM REQUIREMENT—made for tight spots.
- √ ALWAYS UNDER PERFECT CONTROL—eliminates shock.
- √ ¼ TO 10 YARD CAPACITY—models to suit your needs.

THE FAMOUS **STRAYER ELECTRIC** BUCKET
ALSO AVAILABLE FOR AC OR DC OPERATION

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CIRCLE NO. 93, PAGE 71-72

products and processes

Upgraded aluminum alloys / Improve competitive position of permanent mold castings and lighter parts for aircraft. HP 355-T62 has 48,000 ultimate, 37,000 yield, 5% elongation; HP 356-T61 has 45,000 ultimate, 31,000 yield, 12% elongation. 3% increase in cost of HP 355-T62 offers 35% increase in yield over 355-T6. *Kaiser Aluminum & Chemical Corp.*

CIRCLE NO. 1, PAGE 71-72

Industrial communication / Improved Trolleyphone system provides two-way conversation between fixed stations and moving equipment or between two or more moving units. FM units operate through several speakers or as two or more separate systems. *Femco, Inc.*

CIRCLE NO. 2, PAGE 71-72

Crane electrification / Aluminum "Inverted-Y" conductors with sliding shoe collectors in 300, 500, 1000 ampere and larger sizes, are side- or overhead-mounted with hangers which permit conductors to float, obviates expansion joints, eliminates strain on insulators and minimizes their breakage. *Cleveland Crane & Engineering Co.*

CIRCLE NO. 3, PAGE 71-72

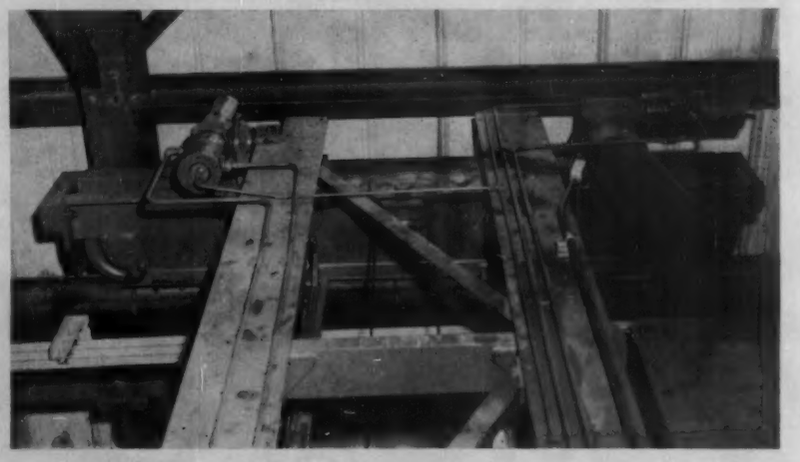
Industrial compressor / 100-300 hp Type FMP is specially designed for continuous operation under the severest conditions with little or no manual attention. *Cooper-Bessemer Corp.*

CIRCLE NO. 4, PAGE 71-72

Light duty lifter / weighing 455 lb, with 3/4 hp motor lifts loads to 1000 lb, 5' 8" at 15 fpm. 39" length affords maneuverability. Available also in battery powered, hand hydraulic, and hand winch models. *Colson Corp.*

CIRCLE NO. 5, PAGE 71-72

Cut-off machine / Model M-35-A cuts metals at less than 4 sec/sq in. Swivel head adjusts 45° either side. Ferrous capacity is 1½" solids; non ferrous, 2½". Takes 12" or 14" abrasive



All-hydraulic crane / Experimental 3-ton overhead traveling crane, believed first ever built, is floor controlled, but adaptable for operator's cage. Apparent advantages are: infinitely variable speed under any load, less maintenance than multi-motored electric counterpart, and about 10% less cost than comparable 3-motored crane. Designs are completed for cranes to 10-ton capacity. *New York Air Brake Co.* CIRCLE NO. 6, PAGE 71-72

wheels and steel saw blades. *Stone Machinery Co.*

CIRCLE NO. 7, PAGE 71-72

Semi-automatic welder / compact and portable, is recommended for hardfacing as well as conventional welding. Welding wire feeds auto-

matically at rate governed by arc, flux feeds through hopper above weld contact and adheres magnetically to the weld wire. *Amsco Div., American Brake Shoe Co.*

CIRCLE NO. 8, PAGE 71-72

Industrial conveyor line / enables its manufacturer to offer completely integrated systems to solve almost any problem involving powered material handling and lifting equipment. *Colson Corp.*

CIRCLE NO. 9, PAGE 71-72

Surface roughness comparator / permits metal surfaces to be compared with a selected standard under- 10-

power magnification. Inexpensive, pocket-sized, hand-held instrument operates on a unique optical principle which greatly emphasizes surface irregularities. *Bausch & Lomb Optical Co.*

CIRCLE NO. 10, PAGE 71-72

Automatic shell core blower / Model MCA-5 performs the entire invest-

FOR EASIER...BETTER SAND CONTROL USE DELTA SCIENTIFICALLY DEVELOPED FOUNDRY PRODUCTS

DELTA
PERMI-BOND
SEA COAL REPLACEMENT IN MOLDING SAND

DELTA PERMI-BOND is a revolutionary development which eliminates the use of SEA COAL . . . and its inherent disadvantages . . . in molding sands.

It is a specially prepared pure hydrocarbon, completely volatile at elevated temperatures. It decomposes to form a vapor-gas cushion, which is reducing in nature, and leaves only a trace (two-tenths of 1% maximum) of ash.

NOTE THESE IMPORTANT ADVANTAGES . . . 1. Always uniform. 2. Eliminates sand contamination. 3. Greatly reduces gas, smoke, soot and dirt in the foundry. 4. Provides correct amount of vapor gas in the mold cavity to prevent casting blows. Allows use of lower permeability sand. 5. Increases dry strength of sand 75% to 90%. 6. Prevents scabbing, buckling, rat-tailing and cutting which greatly reduces scrap castings. 7. Improves casting finish, cuts cleaning room costs to a minimum. 8. More economical to use; reduces your sand costs. 9. Much cleaner and more foolproof to use than sea coal.

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DRI-BOND
IN CORE SAND

DELTA DRI-BOND BINDER is a product of several years of research and experimentation in our own sand research laboratory and proved by additional years of actual experience-in-use data compiled by prominent foundries. The excellent results obtained with Delta Dri-Bond Binder, reported by all sources, establish beyond question both the outstanding superiority and greater economy of this new product for use in steel, gray iron and non-ferrous foundries.

In recent tests, conducted by impartial personnel, it was definitely proved that Delta Dri-Bond Binder has (a) — higher tensile and compression strength, (b) — much greater waterproofing properties and (c) — considerably higher green strength and hot strength than other dry binders tested.

DELTA
SAND CONDITIONING OILS
FOR CORE AND MOLDING SANDS

DELTA SAND CONDITIONING OIL is a very fluid organic liquid with a light greenish color cast. It has a very low surface tension and acts as a lubricant in sand mixes. It improves the flowability and workability of both molding and core sand mixes. Its greatest use is in core sand mixes where, in addition to improving the flowability of the sand, it helps eliminate sand sticking to the core boxes.

It has proven exceptionally useful in the elimination of core sand sticking problems in plastic resin core sand mixes.

DELTA

Get the Facts . . . Working samples and complete literature on Delta Foundry Products will be sent to you on request for test purposes in your own foundry.

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

CIRCLE NO. 94, PAGE 71-72

← *Low operating cost*—Cores made with RCI's FOUNDREZ 7600 resin binder are baked *fast and economically* in this dielectric oven. The cost per ton of labor, materials and fuel is low . . . production rate high.

High core quality — RCI's FOUNDREZ 7600 resin binder permits efficient combinations of sand-cereal-resin and water for cores with low breakage and superior uniformity. Core drier plates are made with RCI FOUNDREZ 7500 . . . a powdered phenolic shell molding resin. ↓

faster core production

other advantages too, with

FOUNDREZ 7600

RCI's liquid water soluble urea-formaldehyde core binder

● FOUNDREZ 7600 core binder and the dielectric oven shown here do a great job together. They cut baking cycles from hours to minutes! But you don't need to operate with a dielectric to benefit from using RCI's FOUNDREZ 7600 resin. With a conventional core oven you can also speed production dramatically!

You can get more cores through a drier with a given heat input; or, if you prefer, *save fuel* by drying the same number of cores with a lower heat input.

FOUNDREZ 7600 also permits flexibility in core formulation . . . makes it easy to vary such properties as green strength, collapsibility, permeability and hardness. You get the best core for each metal — copper, brass, bronze, aluminum, magnesium, gray iron, cast iron or steel alloys.

Reichhold can deliver this liquid resin to you in tank car or tank truck lots (or, at higher price, in non-returnable 55-gal. drums).

Write to RCI for *Technical Bulletin F-2* which gives the many mix variations obtainable with FOUNDREZ 7600 core binder.

Creative Chemistry . . .
Your Partner in Progress

RCI

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Synthetic Resins • Chemical Colors • Industrial Adhesives • Plasticizers
Phenol • Formaldehyde • Glycerine • Phthalic Anhydride
Maleic Anhydride • Sodium Sulfite • Pentaerythritol • Pentachlorophenol

REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N. Y.

CIRCLE NO. 95, PAGE 71-72

ment and curing cycle with a single press of a button. Three automatic machines can be operated at the same time by one semi-skilled person. No ovens, no driers are used. *Shallway Corp.*

CIRCLE NO. 11, PAGE 71-72

Semi-live platform truck / on two wheels and two legs is moved by a wheeled jack and steering handle

which lifts the leg end from the floor. One jack serves several platforms. Power jack available. *Norwood Tool & Machine Co.*

CIRCLE NO. 12, PAGE 71-72

Industrial truck / is equipped with revolving head for automatic dumping into self-feeding hopper to continuous processing equipment. Oper-

ations are speeded, physical effort eliminated, and maximum safety enjoyed. *Elwell-Parker Electric Co.*

CIRCLE NO. 13, PAGE 71-72

Gearmotors and motogears / (to 30 and 60 hp, respectively) deliver more hp/lb through functional design; have output speeds from 280

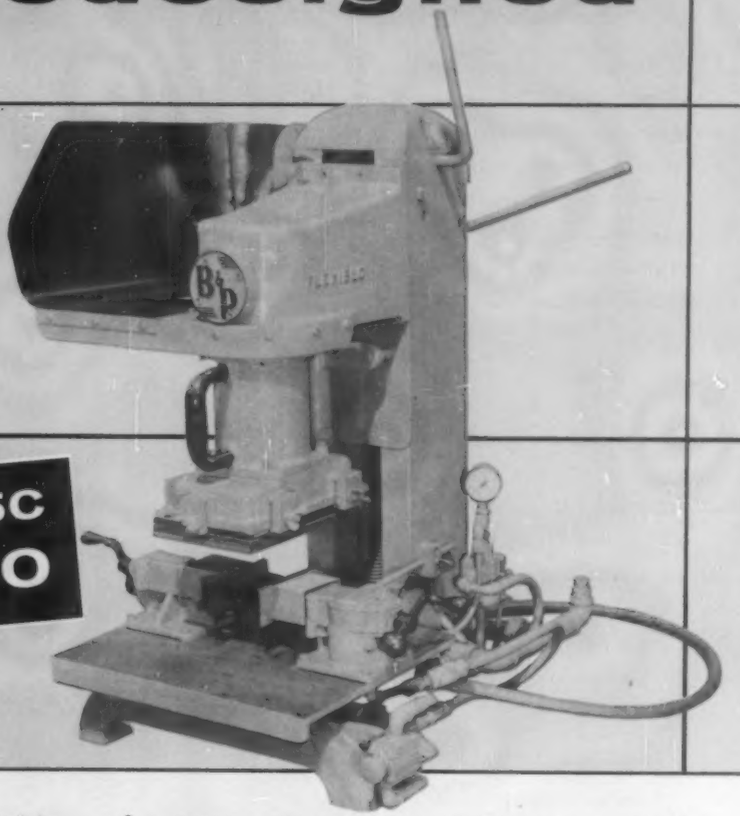
down to 6 rpm. Only one low-speed gear set/drive simplifies ratio changes. Book 2447 *Link-Belt Co.*

CIRCLE NO. 14, PAGE 71-72

Direct fired space heater / oil or gas in 8 sizes (400,000-2,000,000 Btu/

THE MOST WIDELY USED COREBLOWER IN THE WORLD HAS BEEN

completely redesigned



the new CB5C FLEXIBLO

Here's welcome news for foundry operators interested in cutting costs — (and who isn't these days?). The CB5 — for years the most widely used machine in the small coreblower field — has been completely redesigned. The new CB5C brings you important *cost cutting* features never before available in a small blower.

- ✔ Handles all types of boxes and all types of jobs. (The CB5CD even incorporates a full two inch draw cylinder.)
- ✔ Operation is completely automatic and actuated by push button.
- ✔ Clamping, blowing, unclamping etc. are automatically sequenced — top speed with no chance of error.
- ✔ New design blow valve assures perfect cores — cycle after cycle.
- ✔ An automatically-operated removable table clamp for handling vertically-split boxes.
- ✔ Quick-change blow plate and quick height adjustment.

These are but a few of the new features — write now for complete information — Beardsley & Piper, Division Pettibone Mulliken Corporation, 2424 North Cicero Avenue, Chicago 39, Illinois.

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF FOUNDRY MACHINERY

A

ON

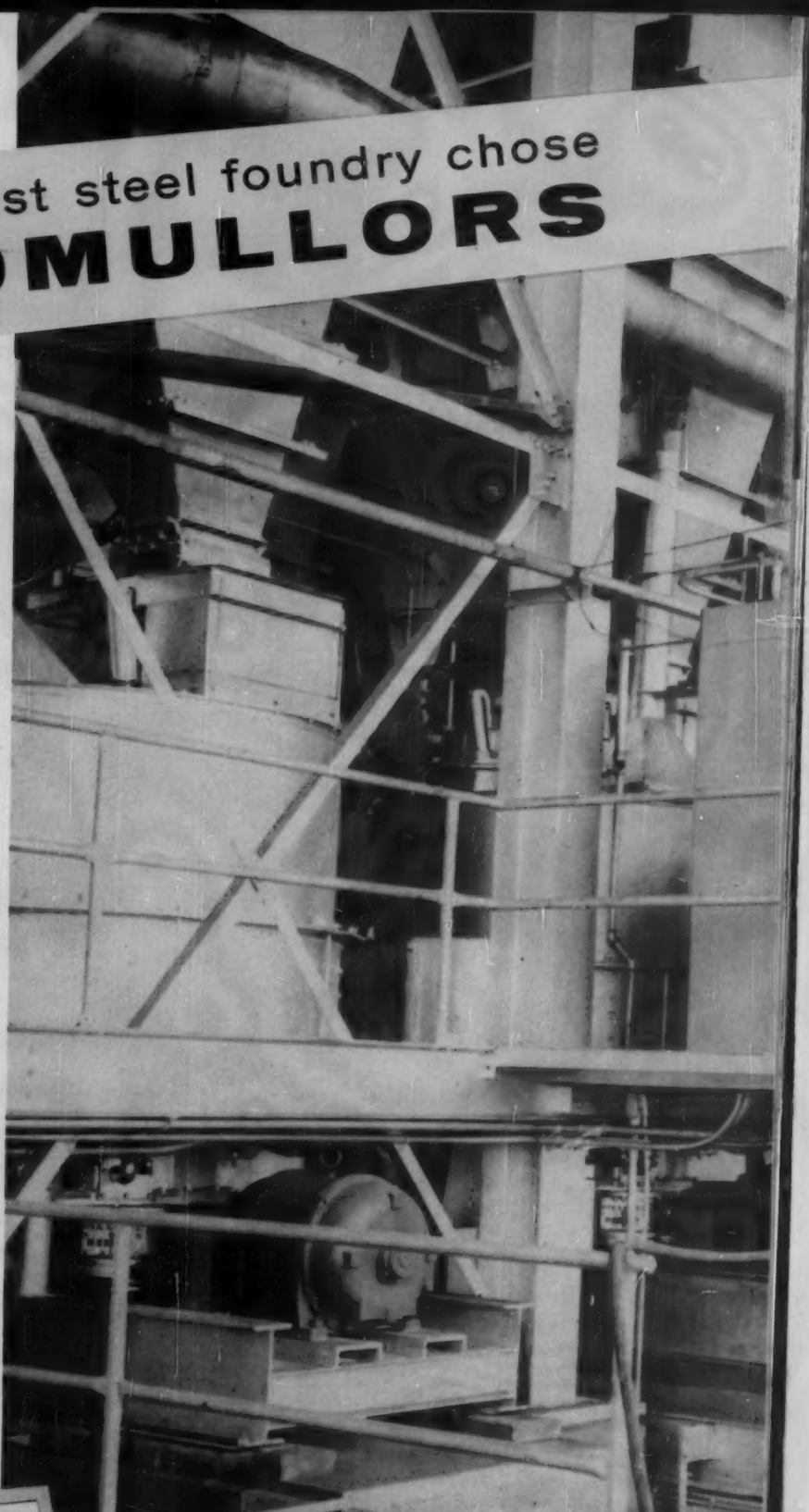
han ever

an ever

NNATEN INGOT

is new ingot means no
er grain structure, more
le in all grades, silvery
tra-close-grain iron.

Canada's largest steel foundry chose SPEEDMULLORS



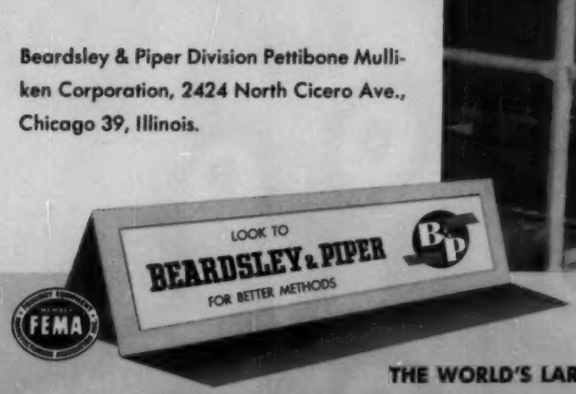
The giant Steel Foundry Division of Canadian Car and Foundry Company is really five large foundries in one. All of these foundries are dependent on a single sand system which might well be considered the *lifeline* of the entire plant.

At the center of this lifeline are four new Model "80 A" Speedmullors which supply all of the molding sand to all five of the component foundries. Here, where dependability is absolutely essential, Canadian Car has followed the ever growing trend and chosen Speedmullors.

MULLTROLMATIC controls are provided for each of the four mullors. A full 24 cubic foot batch of mulled and cooled sand is discharged from each mullor every 70 seconds. The sand is thoroughly mulled so fast that in effect a continuous supply of mulled sand is available. That's important at Canadian Car where four big Sandslingers and Speedslingers are kept busy full time.

Write for your free copy of the Canadian Car story and ask for the new bulletin on the Series A Speedmullors.

Beardsley & Piper Division Pettibone Mulliken Corporation, 2424 North Cicero Ave., Chicago 39, Illinois.

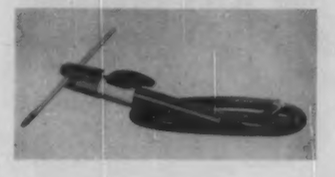


THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF FOUNDRY MACHINERY

hr) with fully automatic electronic controls is claimed to be lowest in cost, highest in efficiency, quickest to install, silent in operation. Ventilates in summer as well. *Airtherm Mfg. Co.*

CIRCLE NO. 15, PAGE 71-72

Cutting and gouging torch / model G-5 is said to be faster than chipping or grinding, cheaper than oxygen equipment, and to leave surface ready to weld. Torch operates from



ordinary welding machine and compressed air line, takes up to 5/8" diam electrodes, and delivers about twice the air of G-3. *Arcair Co.*

CIRCLE NO. 16, PAGE 71-72

Industrial stack / for use where flue gas temperatures don't exceed 1600 F continuous exposure, is made up of 3' pre-cast sections of vermiculite concrete in aluminum jacket. Stack can be used inside or out, requires no painting or maintenance; is about 2/3 less than comparable brick stack and about the same as a comparable steel stack. Is said to give greater draft and last about 3 times longer than a steel stack. In 6 sizes from 10" to 24" ID. *Van-Packer Corp.*

CIRCLE NO. 17, PAGE 71-72

Adjustable forks / Hydraulic clamp and offset fork attachment allows the lift truck carriage to be quickly ad-

justed laterally to handle heavy loads of varying size and shape. *Towmotor Corp.*

CIRCLE NO. 18, PAGE 71-72

Etched finish abrasive / New steel grit blast cleaning abrasive, Steeletts, is particularly adapted to: preparing metallic surfaces for bonding; providing lustre on non-ferrous work by exposing virgin metal and giving it

CIRCLE NO. 96, PAGE 71-72

Now, more than ever, you can depend on

HANNA

as your best source for

PIG IRON

- *Our merchant capacity is bigger than ever*
- *Our plant is better than ever*
- *Our product range is greater than ever*

The

HANNA 38-POUND PIG

The foundryman's favorite standard pig. Available in all grades, silvery and HannaTite. A good example of the quality that has made Hanna "the best known name in iron."

The New

EXCLUSIVE HANNATEN INGOT

For 10-lb.-pig users, this new ingot means no free-carbon pockets, finer grain structure, more even melting. Available in all grades, silvery and HannaTite—an extra-close-grain iron.

THE HANNA FURNACE CORPORATION

Buffalo • Detroit • New York • Philadelphia

Merchant Pig Iron Division of

NATIONAL STEEL CORPORATION

CIRCLE NO. 97, PAGE 71-72

Who put the "Imp" in impellers?

...or how Chuck Wright turns the heat on chill

Pat Kelly, over at Avis Foundry, was casting pump impellers that came back from the machine shop almost as fast as he sent them over. The trouble? Chilled edges.

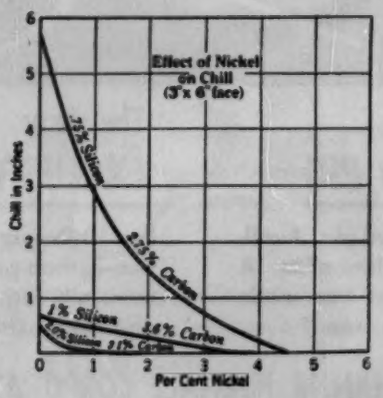
The machine shop, and the front office, too, beefed plenty. Chilled iron always means slow machining speeds, excessive tool wear and poor finish.

Pat noticed chilled edges on the first pieces poured. He increased the silicon in his mix to reduce chill. But this gave him open grained weak iron in the heavy hubs.

His foundry practice was tops. Molding, cores, temperature and so on couldn't be criticized. The trouble, however, was in another place. Pat's order called for castings that had sections varying, in the same casting, from 3/16" to 1½". And that was the rub.

High silicon reduces chilling tendency in thin sections, but results in opened grained, porous thick sections.

From my notebook, I gave Pat this graph illustrating the effects of nickel on chill.



You'll find, just as Pat did, that a little nickel is your best friend whenever you need dense, pressure-tight heavy sections along with strong, yet machinable lighter sections.

The boys at Avis now pour pump impellers in an iron of some 3.25% carbon, 2.30% silicon, and .75-1.00% nickel. Light sections permit high speed machining operations, because chill in the nickel iron is absent. What's more, there's a big saving from the new low finishing costs.

You can get rid of chills . . . and headaches, too . . . with a little nickel. But whether you use nickel or not, whenever you meet up with a difficulty involving the metallurgy of castings, get in touch with me. The easiest way to reach me is through INCO.

Chuck Wright

INCO

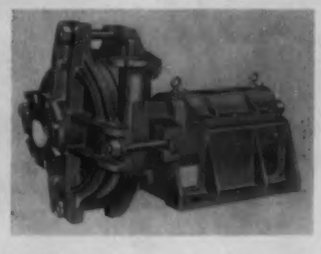
The International Nickel Company, Inc.

67 Wall Street New York 5, N. Y.

a matte-type surface; and descaling heat treated work. In 7 sizes, from G-16 to G-120. *Wheelabrator Corp.*

CIRCLE NO. 19, PAGE 71-72

Slurry pumps / for low-speed continuous duty, handle abrasive slurries under suction lift or positive head. Four bolts allow the Type Q to be opened for most maintenance with-



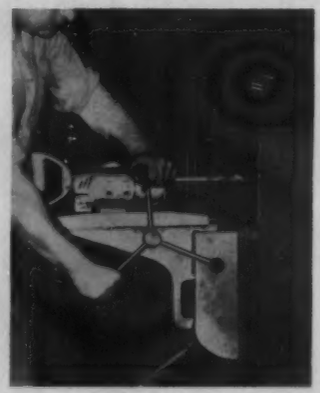
out disturbing piping. Has interchangeable wear liners. Bulletin 186. *Morris Machine Works.*

CIRCLE NO. 20, PAGE 71-72

Winter roof repair / can be made at temperatures below freezing with Winterized 3R containing non-congealing additive which makes heating equipment unnecessary and eliminates accompanying hazards. In aluminum or black, material brushes on smoothly and easily. *Colonial Refining & Chemical Co.*

CIRCLE NO. 21, PAGE 71-72

Magnetic drill press / for maintenance and construction has powerful electro-magnet base to hold accurately to painted or rusted surfaces without cooling-off periods. Portomag is



positioned to the punch mark with magnet in "low." Drilling area is spotlighted. Capacities to 1⅛" drills, 1" taps. *Portomag Sales, Inc.*

CIRCLE NO. 22, PAGE 71-72

V-belts / of Dacron polyester fiber reinforced material transmit up to 40% more power than conventionally reinforced belts. Belt life reported to be 50-250% greater for similar pow-

er ratings. Permits fewer belts and smaller sheaves. *E. I. du Pont de Nemours & Co.*

CIRCLE NO. 23, PAGE 71-72

Inspection glasses / Featherweight Tuc-Away safety spectacle frames feature interchangeable, gold, meth-

yl methacrylate lenses; reduce eye fatigue by softening glare and absorbing almost 100% of harmful ultraviolet rays; improve contrast between black and white. *Watchemocket Optical Co.*

CIRCLE NO. 24, PAGE 71-72

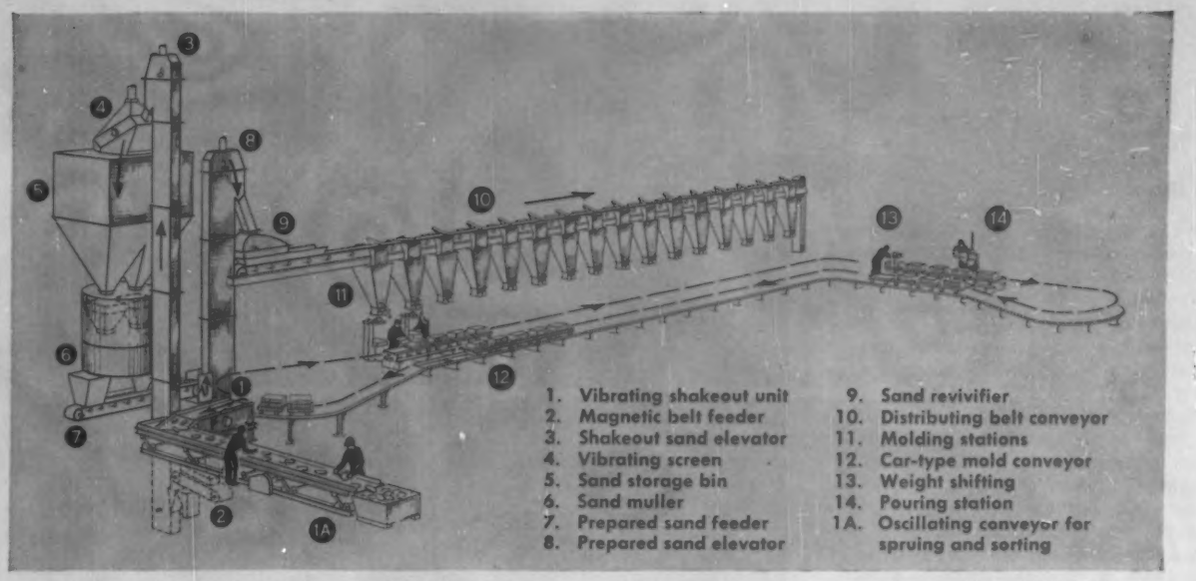
Metal cutoff machine / with large bed takes 16" blades. Swivel cutting head and material clamp allow cutting to 45° with material in position for a straight cut. Equipped for wet cutting, can be used dry. Special adapter sets head to one side for removing gates and risers from large castings. Complete line of blades also available. *Victor Engineering Corp.*

CIRCLE NO, 25, PAGE 71-72

Hard surfacing electrode / Iron powder, low-hydrogen Hardalloy 48 combines speed of contact-type electrodes with weld soundness and crack resistance of low-hydrogen

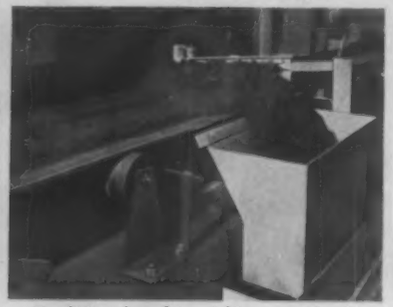
welds; has hardness over 55 Rc: virtually eliminates problems of base metal dilution; first layer essentially as hard as succeeding layers. *McKay Co.*

CIRCLE NO. 26, PAGE 71-72



In this modern foundry layout, movement of sand and castings is completely mechanized. With Link-Belt conveying and preparation equipment, gray iron, steel, malleable and non-ferrous foundries can have lower costs, increased output.

Link-Belt automatic shakeout steps up production, removes workmen from hazardous areas, frees them for other jobs.



Conditioned sand is quickly, conveniently distributed to molders' hoppers by flat roll belt conveyor with adjustable plows.

Ideal for handling hot sand and castings, Oscillating conveyors speed cooling, spruing and sorting of castings while en route.

Link-Belt mechanization not only makes large and small foundries a better place to work - - it

raises production-lowers unit costs

TODAY, large and small foundries alike find modernization the only answer to intensified competition. To bring down their costs and make the most efficient use of manpower, they have conveyorized sand and casting handling to a degree undreamed of even a few years ago.

Many of these progressive foundries are completely equipped with Link-Belt conveying and preparation equipment. And just as others have been able to produce better castings at lower cost, Link-Belt mechanization can step up your profits, too. That applies whether your foundry is gray iron, steel, malleable or non-ferrous. Whatever you require in equipment or engineering services, Link-Belt can cut your operating costs . . . and at the same time make your foundry a better place in which to work.

Whenever you have a castings or sand handling or preparation problem, you'll find it pays to call your nearby Link-Belt office. Ask for Book 2423. It shows Link-Belt's complete line of modern equipment for ferrous and non-ferrous foundries plus 7 tested layouts.

LINK-BELT

19,741

CONVEYORS AND PREPARATION MACHINERY

FEMA

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

CIRCLE NO. 98, PAGE 71-72

pouring off the heat

if the shoe fits . . .

■ Congratulations for publishing the superior article *"How to Save $½ Million"* by A. J. Carah in the November issue of MODERN CASTINGS. The need for articles such as this has existed for a long time in the castings industry and it is encouraging to find them and particularly one of such excellent calibre.

This article emphasizes the necessity for cooperation between the designer and the foundryman, but from the designers viewpoint. This puts the shoe on the other foot as compared with the often-repeated admonition to "get the designer to design the casting for the casting's sake." This latter approach while obviously necessary, is giving way in importance to the designer's demands for high strength-to-weight ratio designs which require casting and material quality standards of high order.

The union of these approaches is implied in this article and it would be extremely interesting to have a supplementary article describing the foundry's contribution to this effort. While the thumb rules of foundry practice provide bases for quality improvement, it is readily apparent that good foundry engineering was required for the job.

Many lessons can be learned in this article. The material selection philosophy, the testing programs, the relationship of test bar properties to casting properties and the significance of this in design, the control of quality in production runs, the economics of broad approaches to engineering problems, all bear close scrutiny by all people interested in the foundry business.

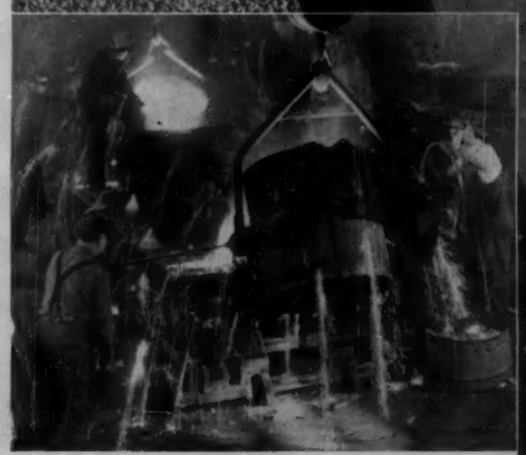
Please let us have more of this!

R. P. DUNPHY, *Metallurgist*
Mechanical & Materials Engineering Standards
Radio Corporation of America
Camden, N. J.

grains may grow

■ *A Hard Look at the Castings Industry"* by Hiram Brown which appeared in the December issue of MODERN CASTINGS was very interesting and informative. However, I cannot agree entirely with the statements regarding stability of grain size in castings. The author states

BRUTE

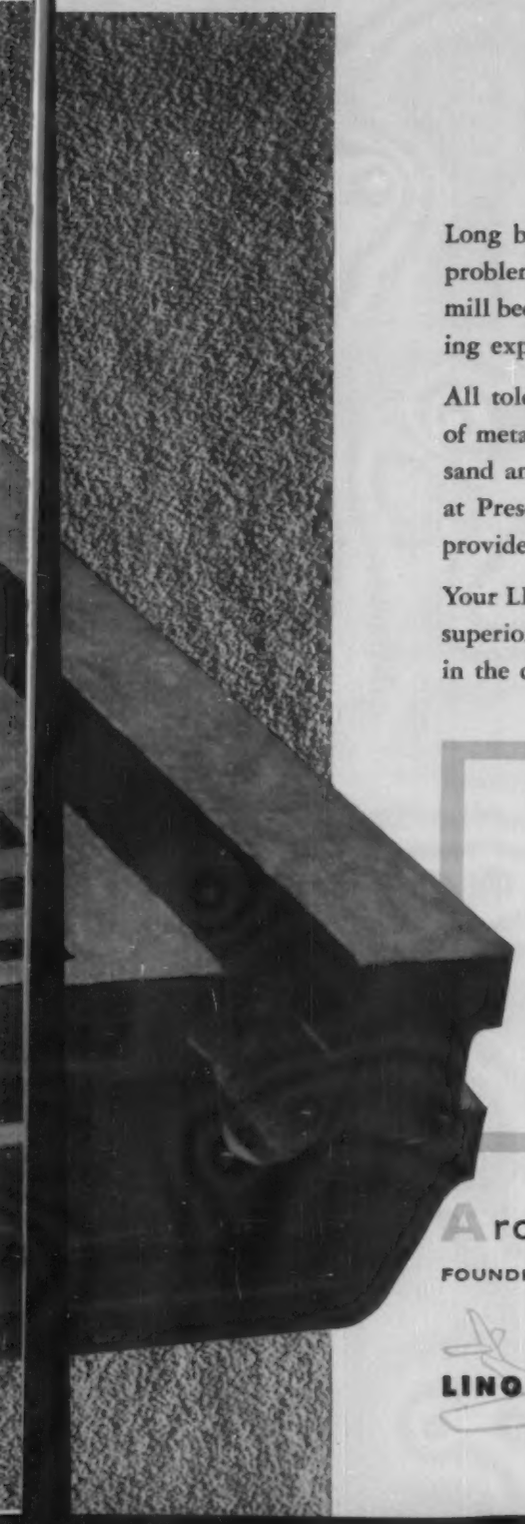


The Prescott Company pours 32 tons of metal to make one casting for a skin mill bed plate. Using four ladles, it takes four minutes to pour one casting.

CASTING

CONSUMES 126 GALLONS OF

LINOIL



Long before a skin mill starts turning out airplane wings, production problems arise. For instance, making the intricate, 30-ton castings for the mill bed plate was a problem until The Prescott Company took over. Combining expert craftsmanship with the finest of materials, Prescott did the job.

All told, they poured 32 tons of metal for each casting . . . only two tons of metal for risers, gates and sprues. The core mix included 37 tons of core sand and 126 gallons of LINOIL per casting. Dependable LINOIL is used at Prescott Company. That's because it is always uniform. LINOIL also provides the workability and thorough baking qualities these castings demand.

Your LINOIL man has more than 50 grades of LINOIL to help you produce superior castings. And he's backed by the largest technical service organization in the core binder business. Why not call him today?

CASTING STATISTICS

Foundry	**The Prescott Company, Menominee, Mich.**
Size of casting	22 feet long, 8 feet wide, 3 feet high
Number of cores	64
Average weight per core	1,200 lbs.
Weight of casting	30 tons
LINOIL used	about 126 gallons
Core sand used	37 tons
Pouring time	4 minutes using 4 ladles
Metal	Meehanite, Type GC; 45,000 lbs. tensile strength; 200 Brinell hardness

Archer • Daniels • Midland company

FOUNDRY PRODUCTS DIVISION • 2191 WEST 110th St., CLEVELAND 2, OHIO

LINOIL • INDUCTOL • LIN-O-CEL • FREFLO • ADMIREZ

"The grain size of most cast metals —provided they have not been plastically deformed by working—cannot be changed below the melting point. (The only exception to this are alloys such as steel which undergo an allotropic change in crystal structure with the formation of new grains.)"

It is well recognized that grain growth can occur in magnesium castings when subjected to temperatures at or near the solution treating temperature. This phenomenon (germination) is quite likely to occur in alloys high in aluminum and low in zinc, such as AZ91 and AZ92 alloys. Grain growth in this instance is not a condition which occurs throughout the castings. It is usually confined to chills and sections where stress gradients exist, though the magnitude of stresses may be of low value. The resulting grains are usually present in uneven shaped areas surrounded by the predominant fine grain structure.

Test specimens machined from coarse grain and fine grain areas in the same casting will show a marked difference in tensile and yield strength.

It is to be noted however, that grain growth can be prevented by varying the solution heat treatment cycle.

This subject was briely brought to the attention of foundrymen in a paper entitled *"Heat Treatment of Magnesium Alloy Castings"* by E. M. Gingrich, which was presented at the 1952 AFS Convention.

B. L. Meredith, *Research Met.*
Central Research Laboratories
American Smelting & Refining Co.
South Plainfield, N. J.

■ I have personally never experienced the grain growth referred to in connection with magnesium castings. However, if strain gradients do exist then certainly germination can occur during heat treatment. I hope Modern Castings will call this to the attention of the readers so they can profit as I have from the observation.

Hiram Brown, *Company Chf. Met.*
Solar Aircraft Co., Des Moines

Answer questions by sending for data describing the newest products and processes. Order by using the cards on **page 71-72.**

CIRCLE NO. 99, PAGE 71-72

BE PREPARED FOR PROFITS!

use *Famous* CORNELL CUPOLA FLUX

Have you tried Famous Cornell Aluminum Flux?

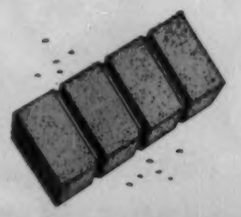
Have you tried Famous Cornell Brass Flux?

Write for Bulletin 46-A

It's as sure as having extra profits in your hand when you make it a practice to use Famous Cornell Cupola Flux. Here's why! A little of Famous Cornell Cupola Flux added to each cupola charge of iron purges molten iron of impurities. You pour cleaner metal. Your castings are easier to machine and have greater tensile strength throughout.

All these benefits are possible because Famous Cornell Flux is not just *another* foundry flux. Rather, it is a scientifically prepared combination of high-grade fluorspar and other materials which cause a desired chemical reaction in molten iron—a reaction which increases the amount of slag that floats and flows off. You'll find that Famous Cornell Flux is made in easy-to-use scored brick form. With each ton charge of iron, you simply toss one brick into the cupola. The cost? Just a few cents per ton of metal.

Call a Cornell Flux engineer today and get the full profit-making details of this extraordinary cupola flux. Or write for Bulletin 46-B.



The CLEVELAND FLUX *Company*

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Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

FAMOUS CORNELL FLUXES

Trade Mark Registered

Will Show New Processes

New sand binding processes and non-ferrous problems will be featured at the remaining sessions of the Educational Program of the Philadelphia Chapter of the American Foundrymen's Society.

The series of six educational sessions and two plant visits which began January 16 was planned to interest molders, patternmakers, apprentices, production supervisors, teachers and students.

All educational sessions (non-dinner meetings) are held at 7:45 pm at the Engineers Club, 1317 Spruce St., Philadelphia, Pa., in the Junior Room, 3rd floor. Plant visitations (non-dinner) start at 8:00 pm.

Educational Sessions

Monday, March 19 . . NON-FERROUS ROUND TABLE, Philip J. Keeley, Northern Bronze Corp., discussion leader.

Friday, March 23 . . GRAY IRON & STEEL COMBINED MEETING, *"New Processes,"* Clifton S. Merkert, Olney Foundry Div., Link-Belt Co. "Shell Molding" film, courtesy of Link-Belt. Demonstrations of the use of two new core binders will be made through the courtesy of Pennsylvania Foundry Supply & Sand Co. and Atlantic Steel Castings Co.

Plant Visitations

Friday, April 6 . . General Steel Casting Co., Eddystone, Pa.

Friday, April 20 . . Florence Pipe Foundry & Machine Co., Florence, N. J.

AFS Issues Project Reports

Sustaining members of the American Foundrymen's Society have been furnished progress reports gratis on eight society-sponsored research projects. The reports covered projects that include: risering gray iron, melting malleable iron, evaluating sand mixtures, scab defects, vertical gating, chills, hot tear defect, and steel sands at elevated temperatures.

Also sent to the sustaining members was a copy of the 1955 Hoyt Memorial Lecture, *"Education and Future Foundrymen."*

The papers, presented at the Houston convention, are included in the 1955 AFS TRANSACTIONS.

CIRCLE NO. 100, PAGE 71-72

talk of the industry

SATISFIED CUSTOMERS are building Roloff Mfg. Corp., Kaukauna, Wis., according to Wally Roloff, president. It's easy to see why. Gray iron green sand castings are being held to 0.015-0.020" (total inches, not inches per inch) in dimensions up to 16." And how's this? An 11" D cable drum with a 14" face cost a customer $13.70 to machine 12 grooves for a 9/16" cable. With Roloff casting the grooves, no machining is necessary (except the bore) and the customer is now getting three castings—ready to use—for the price formerly paid for only one!

FIRST AID FOR CORE BOXES now comes in patches like those do-it-yourselfers use on fingers and knuckles. No reason now for worn, abraded areas under blow holes that allow cores to come oversize in critical areas. Available is a protective plastic patch with a pressure sensitive adhesive on one side that has stood up to 5000 blows at 135 psi. With plenty of stretchability, pad fits most complex contours, is replaceable in seconds by coremaker without taking box out of production. Pad is not harmed by cleaning compounds, even stands soaking in most of them.

SUPERVISOR INVENTORY? You inventory materials and machines, why not men? Central Foundry Div. of General Motors Corp. has looked ahead and expects to have to fill 69 supervisory posts between now and 1960. They're planning today for tomorrow's requirements, according to James H. Smith, division general manager, and are looking over men presently available inside the organization as well as those who will be available from General Motors Institute and the schools participating in the Foundry Educational Foundation program.

FOUNDRY OF THE FUTURE may be closer than the May issue of MODERN CASTINGS will indicate. Company in the east has just ordered the first two hydraulically operated, high pressure molding systems. Units are fully automated except for core setting and pouring. Each will occupy an area 75' x 150', will make 120 green sand molds per hour in 36" x 52" tight flasks. Six or less men will tend each unit.

FOUNDRYMEN ARE NOT forgotten industrialists as far as the Armed Forces are concerned in spite of what many castings producers may think according to L. L. Henkel, educational specialist, with the

Industrial College of the Armed Forces at Fort Lesley J. McNair, Washington, D. C. A past president of the Chicago Chapter of the American Foundrymen's Society, he teaches natural resources requirements and production, and technological developments primarily to top military personnel expected to become tomorrow's generals and admirals. The Industrial College, only one of its kind in the world, is dedicated to the achievement of better understanding and smoother functioning of the civilian-military defense team. In addition to a 10-month resident course, the College conducts correspondence courses and stages 2-week National Resources Conferences in major industrial centers of the United States. These courses are attended by reserve officers representing all services. Local civilian leaders of industry, business, labor, education, and civic groups are also eligible for NRC.

5 "IMPS" are the gremlins which cause failure in management communications, according to Dr. Charles E. Irvin, Michigan State University, speaking at the Wisconsin Regional Foundry Conference. They are: Impatience—failure to do precommunication thinking; Impersonal—like one machine talking to another; Impassive—management gobbledegook; Impenetrable—professionalese that requires you to be "in the know" to understand; Imposing—great bulk due to verbal diarrhea.

MARKING AND COATING stainless steel has been done successfully for the first time according to the company which developed the process. New photo-chemical technique is reported to produce a hard, ductile, jet black, permanent coating on metals with a minimum chromium content of 11%. Coating is expected to be used not only for marking (lines as fine as 0.001", 150 screen photos) but also for protection against acids, alkalis, abrasion. Coating stands up to 1700 F in air, has withstood a variety of corrosive media.

NOBODY APPRECIATED the importance of training new blood for the castings industry more than the late Bob Kennedy, secretary emeritus of the American Foundrymen's Society. One of the many steps he took in this direction was the organization of a competition for upcoming foundrymen and patternmakers. Since 1923 it has been known as the AFS Apprentic Contest. In memory of its founder, the competition has been renamed Robert E. Kennedy Memorial Apprentice Contest.

CAN YOU THINK of a better reason for trying to improve your product—the castings you sell? Lew Durdin, president of Dixie Bronze Co., Birmingham, Ala., says he's never made a product improvement that hasn't given him a simultaneous cost improvement.

Herbert F. Scobie

let's get personal

S. C. Massari . . former technical director of American Foundrymen's Society has joined National Engineering Co., Chicago, as director of research. Massari will deliver the Hoyt Memorial Lecture at this year's AFS Casting Congress.

D. H. Workman . . executive vice-president of Gray Iron Founders' Society has been appointed to Government Relations Committee and Advisory Council on Federal Reports of the American Trade Association Executives.

J. T. Osler . . former board chairman of Continental Foundry & Machine Co., has been named consultant to Blaw-Knox Co.

Everett G. Fahlman . . president of Permold Co., Medina, Ohio, and pioneer in permanent mold casting, has been re-elected president of the Aluminum Association.

David T. Martin . . has been named director of quality control for Central Foundry Div., General Motors Corp., Danville, Ill.

Harold C. Amos . . former instructor in foundry practice at University of Nebraska has joined staff of mechanical engineering department, University of Idaho, under Norman F. Hindle, who heads the department. Hindle is a former technical director of the American Foundrymen's Society.

Dr. Anthony Kelly . . former University of Birmingham (England) research fellow has joined faculty of department of metallurgy at Northwestern Technological Institute as assistant professor.

Alfred F. Bauer . . elevated from chief engineer to assistant general manager of Doehler-Jarvis Div., National Lead Co., Toledo, Ohio.

Frank L. Middleton . . former New York sales manager has been named assistant sales manager of Ajax Metal Div., H. Kramer & Co., Philadelphia.

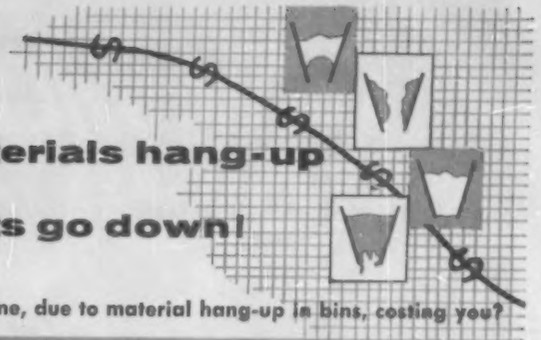
James Suttie . . vice-president of American Steel Foundries, Chicago, has retired after 44 years with company. Scots-born executive has served Steel Founders' Society and several government advisory agencies.

S. F. Carter, Jr. and Ralph Carlson . . moved up at American Cast Iron Pipe Co., Birmingham, Ala., as Car-

S. C. Massari

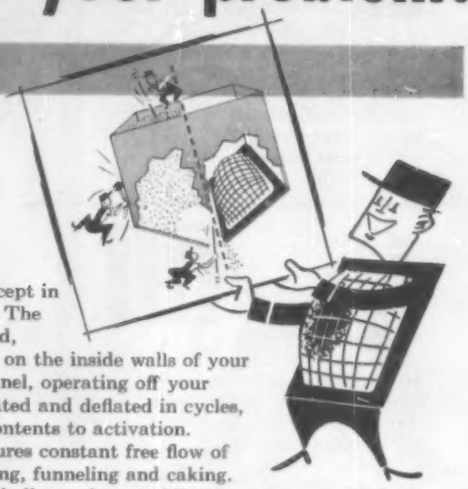
H. C. Amos

J. Suttie



If you have a problem of material flow from your bins, your entire production line is bound to suffer.

PneuBin can solve your problem!



- **Safe**
- **Economical**
- **Quiet**

PneuBin panels are a new concept in bin-stored material activation. The PneuBin panel is a steel-backed, Neoprene diaphragm mounted on the inside walls of your present bins. This PneuBin panel, operating off your regular plant air supply is inflated and deflated in cycles, positively displacing the bin contents to activation. This positive displacement assures constant free flow of materials . . . eliminates bridging, funneling and caking.

PneuBin engineers will gladly make no-obligation recommendations on your specific material handling problems. Write for FREE literature and "*Flow Stoppage Report.*"

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MAY CORPORATION

MANUFACTURERS OF—

1547 MARYLAND AVENUE, BALTIMORE 3, MARYLAND

Hydraulic Pumps and Motors

Variable Speed Hydraulic Transmissions

PneuBin—Pneumatic Bin Evacuators

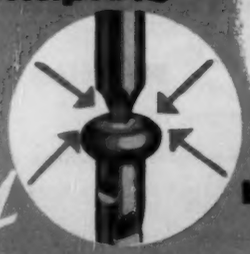
CIRCLE NO. 101, PAGE 71-72

Only fine **FANNER**

shoulder radiator chaplets

have the exclusive

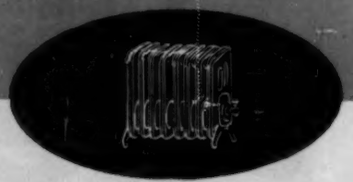
4 way **break-off nick**



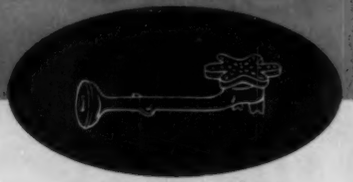
to improve production... save money

IDEALLY SUITED FOR

automotive castings



radiator castings



stove parts castings

EXCLUSIVE *New* 4-WAY BREAKOFF NICK

Provides maximum support during pouring, yet stem breaks off easily in any direction so that the few remaining after shake-out can be easily brushed off with no apparent surface marks remaining.

STAGGERED KNITTING NICKS

Provides better type of surface for knitting with molten metal, assuring thorough fusion and resulting in clean, solid castings.

STURDY SHOULDER AND SOLID RIVETED HEAD

Shoulder is designed and placed to permit chaplet to be set into pattern required distance without guesswork. Solid riveted head exactly at right angles to stem to insure that chaplet is always perfectly "true".

For better quality castings, for time and money savings in production use fine FANNER radiator chaplets. The exclusive four way break-off nick plus their other features speeds production of cleaner, sounder castings and reduces labor costs.

The development of the 4 way break-off nick is one more example of Fanner's constant study and engineering based on more than 60 years of experience in foundry practice.

Fine FANNER Radiator Chaplets are particularly suited for light pressure castings such as gas burners, radiator sections, manifolds and others. They are designed for use with the side of the greatest bearing surface against the green sand and will support approximately 5 pounds per square inch load.

Get complete information on FANNER Radiator Chaplets with the "4 way break-off nick" and other fine FANNER chaplets by writing for the FANNER Chaplet catalog today!

Qualified and specialized engineers in Fanner's Technical Service Division are available for consultation, without obligation, on problems of producing more intricate castings; developing increased strength, closer tolerances, and better quality; reducing machining and improving finish — both in ferrous and non-ferrous castings. Take advantage of the research and development work that Fanner has invested in this field to improve your profit picture! Simply direct your request to the address shown below.

THE FANNER MANUFACTURING CO.

Designers and Manufacturers of Fine Fanner Chaplets and Chills

BROOKSIDE PARK • CLEVELAND 9, OHIO

CIRCLE NO. 102, PAGE 71-72

ter moved to assistant works manager and Carlson replaced him as melting superintendent.

W. E. Viggers . . will sell manganese and alloy steel castings in New York City for Taylor-Wharton.

Martin A. Harder . . has retired from Lakeside Malleable Foundry,

M. A. Harder

Racine, Wis., after 51 years in the castings industry. He has moved to Phoenix, Ariz.

Leslie L. Shafer . . moves from personnel to become assistant sales manager of Central Foundry Div., General Motors Corp., Danville, Ill.

E. Kendrick Leavenworth . . has been transferred to technical processes and economic engineering staff of Climax Molybdenum Co.

H. R. Dahlberg

Harry R. Dahlberg . . has joined Braden Copper Co., Rancagua, Chile, and will supervise iron, steel and brass foundry operations.

William E. Mahin . . resigned as vice-president and director of research for Hunter Engineering Co. and will establish research and de-

velopment management consulting service at Cedar Hills, Cambridge, Ohio.

Webb L. Kammerer . . president of Midvale Mining & Mfg. Co., St. Louis, has been given a life ap-

W. Kammerer

pointment to the board of directors of Washington University (St. Louis), his alma mater.

W. M. Caldwell . . assistant secretary of Gray Iron Founders' Society has been appointed to the Education Council of the American Trade Association Executives.

Grey W. Tressler and W. E. Dunnick . . were promoted at Titan Metal Mfg. Co., Bellefonte, Pa. Tressler is now vice-president, manufacturing, and Dunnick is works manager.

F. J. Koegler

Frank J. Koegler . . general manager of Doehler-Jarvis Div., National Lead Co., has been elected to board of parent company.

Apex Smelting Co. has promoted three top sales personnel: **William N. Brammer** to eastern sales manager, Cleveland; **George H. Starmann, Jr.,** to midwest sales man-

Plenco shell molding resins and Brillion casting skill give Reo Power Mowers cost-saving improvements

TWO VIEWS of Reo Lawn Mower motor cylinder block showing improved result of shell molds made with Plenco #47 resin. Advantages obtained include: **1—Better tool life and higher machining speeds due to clean smooth surface finish of casting. 2—Cleaner intake and exhaust ports with shell cores, making possible a slight increase in the horsepower of the engine. 3—Reduction in the number of rejections due to porosity in the cylinder wall or bore. 4—Two holes cored; previously these holes were drilled into the solid casting. 5—Locating pads held to closer tolerance, reducing machining scrap. 6—All core areas cleaner and overall appearance greatly improved.**

Reo Model TKS-21, Power Trim, Power Propelled Lawn Mower. Its 2¼ h.p. four cycle engine utilizes the engine block casting described here.

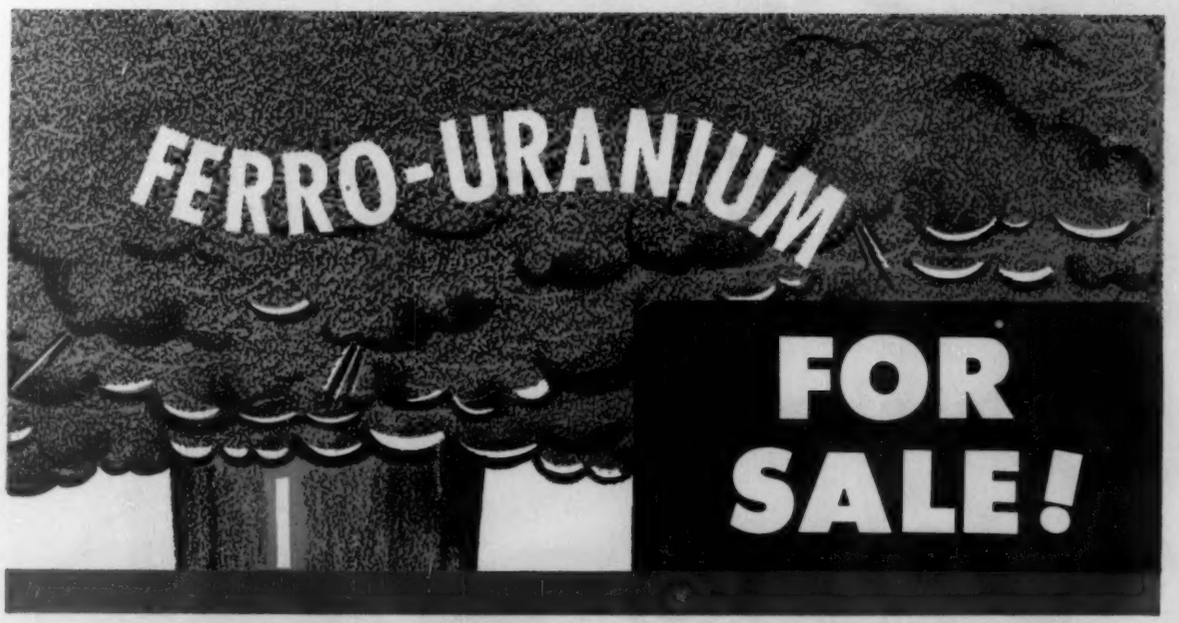
Shell molding eliminated 190 pounds of molding material in casting four of these 11-pound gray iron cylinder blocks for the engine of the Reo Power Lawn Mower. This economy was made possible by the precision shell casting of Brillion Iron Works, Brillion, Wis., with Plenco #47 resin.

The former dry sand method required 114 pounds of molding material for two castings. The shell mold process requires only 38 pounds of molding material for four castings. Casting weight itself was reduced by one pound over the dry-sand cast part as less machining stock was necessary. Substantial savings were thus effected by Brillion in labor, time and materials. Here is another example of how a foundry, by splendid engineering, made use of the shell molding process in improving a product at lower cost.

Such savings are but a few of the many advantages offered by Plenco phenolic resins. Consult with us on your shell molding problems and the application of our various Plenco resins, solid and liquid, and also adhesives for this process.

PLASTICS ENGINEERING COMPANY
Sheboygan, Wisconsin
Serving the plastics industry in the manufacture of high grade phenolic molding compounds, industrial resins and coating resins.

CIRCLE NO. 103, PAGE 71-72



If you were to see such an advertisement would you think it a fraud? If you considered it possible, would you think it was a development of this atomic day in which we live?

Believe it or not, ferro uranium was produced and uranium steel was produced not this month, or this year, but more than thirty-five years ago.

A treatise published in 1921, giving a full account of this unbelievable ferro-alloy said in part:

"Uranium is supplied to the steel manufacturer in the form of Ferro-uranium. No difficulties in its employment are found, provided that reasonable precautions are taken in its addition; such precautions are explainable by *the remarkable chemical activity of uranium.*"

Prophetic words those! Little did the experimenters of 1921 realize what a monster they had by the tail. In undramatic language, the writer of this treatise suggested that uranium steel would "increase tool life" and concluded by saying, "Uranium steel marks the greatest single advance in alloy steels in recent years." This evaluation of Uranium steel proved to be far too optimistic. It was difficult to control and never won for itself a place in industry.

So we don't have any ferro-uranium for sale, but we are proud of an industry that has enough imagination to run thirty years out beyond the frontiers of scientific knowledge.

We're proud to be a part of the alloy steel industry for whom we have produced quality ferro-alloys for almost a third of a century.

CIRCLE NO. 104, PAGE 71-72

ager, Chicago; and **John J. Stobie, Jr.,** west coast sales manager, Long Beach, Calif.

Clifford E. Wenninger . . has moved from National Engineering to HydroBlast Corp. where he is

C. E. Wenninger

now technical director. Wenninger will supervise a long range development program.

Mel Conwell . . leaves production end of castings business to consult on die and sand castings for George Sall Metals Co., Philadelphia.

Chain Belt Co., Milwaukee, announced two promotions as **W. B. Marshall** moved to the new post of manager-market development & sales training, and **G. H. Pfeifer** was appointed manager-sales promotion and advertising.

G. H. Pitts

Guy H. Pitts . . has been named manager of the fabrication division of Bohn Aluminum & Brass Corp., Detroit.

W. E. McCullough . . has been appointed George Sall Metals Co., Inc., sales and service representative for western Pennsylvania. with headquarters in Pittsburgh.

Paul J. Knodla . . was appointed supervisor of metal chemicals section of American Cyanamid Co., New York.

Bruce Cramer . . has been appointed refractories engineer for Michigan and Indiana by Norton Co.

J. W. Vaughan

Gordon Ley . . appointed Denver district sales representative for Electric Steel Foundry Co., Portland, Ore.

Donald L. Shirley . . has been appointed Pacific Northwest sales manager for Link-Belt Co., with headquarters in Seattle.

John D. Sheley . . transferred and promoted by Black-Clawson Co.; he is now plant manager of Watertown, N. Y.

Charles H. Deane . . has joined metal department of Bache & Co., New York.

Pangborn Corp., Hagerstown, Md. has appointed three new sales engineers. **T. O. Weaver** and **Alexander J. Szabo** will specialize in abrasives, Weaver in Chicago and Szabo in Detroit. **Paul P. Butler** will sell all company products in Pittsburgh area.

George D. Fraunfelder and U. M. Johnson . . have been elected vice-presidents of Easton Car & Construction Co., Easton, Pa.

William B. Towner . . has been appointed general production manager of Foote Mineral Co., Philadelphia.

J. C. Cary . . has been appointed sales engineer for Morris Machine Works in New York, northern New Jersey and Long Island area.

Charles O. Morris . . has been appointed assistant manager of pig iron sales, American Steel & Wire, Cleveland.

Fred E. Solymos . . has been appointed vice-president and general sales manager, Colonial Metals Co., Columbia, Pa.

John W. Vaughan . . has joined Alter Co., Davenport, Iowa, as assistant to vice-president, alloy metal division. He was formerly with *Steel* magazine.

Warren A. Scott . . joined the sales staff of Brumley-Donaldson Co., Los Angeles, after seven years with Whiting Corp.

H. K. Intemann . . has been named executive vice-president of Electro Metallurgical Co., New York.

Robert J. Wright . . has been named staff engineer for dust control department of American Air Filter Co., Inc., Louisville, Ky.

Ned Woolums and Paul R. Reaver . . have moved up at Parker Sweeper Co., Dayton, Ohio, Woolums is

N. Woolums

now vice-president, manufacturing, and Reaver moves into plant superintendent's spot.

Henry Herbruggen and Vincent Janis, Jr. . . move into new posts at Federal Foundry Supply Co., Cleveland, with Herbruggen promoted to manager of engineering and design of the San-Blo division as Janis takes over as chief engineer. Herbruggen developed core and mold blowing machines for Federal.

COKE WHEN YOU WANT IT

Only Semet-Solvay has 4 coke plants to serve you. There's one in your vicinity. For fast service, for dependable, uniform coke that means "Better Melting" specify Semet-Solvay Foundry Coke.

SEMET-SOLVAY DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street — New York 6, N. Y.
Buffalo • Cincinnati — Cleveland • Detroit
In Canada: SEMET-SOLVAY COMPANY, LTD., Toronto
Western Distributor: WILSON & GEO. MEYER & CO., San Francisco

For Better Melting

CIRCLE NO. 119, PAGE 71-72

For Permanent Marking
use Markal PAINTSTIKS
HANDY AS A PENCIL

FADE-PROOF
WEATHER-PROOF
LONG MILEAGE
VARIETY OF COLORS
ANY TYPE SURFACE . . . HOT OR COLD

Cold: — 40 to +150 F.
Hot: +150 to 2000 F.

Engineering Service Available. Consult us for any type of marking problem . . . no obligation.

Write For Free Sample and Brochure . . . State Marking Conditions.

Markal COMPANY
3093 West Carroll St.
Chicago 12, Illinois

CIRCLE NO. 120, PAGE 71-72

How to Get the Most

Out of the AFS Castings Congress

■ Everybody expects to gain by participating in an AFS Castings Congress. But few foundrymen get all they can out of these events.

This year's technical sessions and manufacturers' displays in Atlantic City, May 3-9, are no exception. Again thousands of Congress-goers will miss many of the benefits of attendance unless they follow a few simple rules that anyone can apply to any convention.

Here's what you should do.

■ **Plan early.** Don't merely attend with the idea of seeing what will develop for you. There are too many activities and exhibits for you to cover by chance. Look the program over (highlights appeared in February, full program will be next month's Bonus Section) and pick your technical sessions, luncheons, dinner meetings, and shop course sessions.

Practice of grouping sessions by industry interest to enable foundrymen to take in the greatest possible number of meetings in the shortest time has been followed again this year. The more than 50 sessions to be held during Castings Congress Week are scheduled as follows:

Gray Iron. Thursday May 3 through Tuesday May 8, four technical sessions, two shop course meetings, one round table luncheon.

Malleable. Thursday May 3 through Saturday May 5, two technical sessions, one shop meeting, one round table luncheon.

Sand. Thursday May 3 through Wednesday May 9, five technical sessions, two shop course meetings, one round table luncheon.

Brass & Bronze. Thursday May 3 through Saturday May 5, three technical sessions (one a defective casting clinic), one round table luncheon.

Pattern. Friday May 4 through Tuesday May 8, two technical sessions, one round table luncheon.

Education. Friday May 4 through Monday May 7, two technical sessions, one round table luncheon.

Light Metals. Friday May 4 through Tuesday May 8, four technical sessions, one round table luncheon.

Plant & Plant Equipment. Friday May 4 through Wednesday May 9, three technical sessions.

Industrial Engineering-Costs. Saturday May 5 through Tuesday May 8, two technical sessions, one round table luncheon.

Refractories. Saturday May 5, one technical session.

Heat Transfer. Monday May 7 and Tuesday May 8, two technical sessions.

Steel. Monday May 7 through Wednesday May 9, three technical sessions, one round table luncheon.

Safety, Hygiene, & Air Pollution Control. Tuesday May 8 and Wednesday May 9, two technical sessions, one round table luncheon, and a management dinner.

"Casting Sales and Product Development," The Hoyt Memorial Lecture by S. C. Massari, National Engineering Co., will be presented after the Annual Business Meeting Luncheon Saturday May 5.

■ **Check exhibits** (partial lists in January, page 29, and December, page 57; complete exhibits directory by product keyed to exhibit hall floor plan in May) to make sure you don't miss any product or service likely to help you with a current problem. With more than 225 exhibitors, all available display space was sold almost immediately and an additional 3400 sq ft had to be made available by removing two wall areas in the gigantic Atlantic City Convention Hall.

■ **Reserve hotel rooms early.** Application blank appeared in the January issue of MODERN CASTINGS on page 27. Note prices and types of rooms, make your selection (list several choices), and send form to the AFS Housing Bureau in Atlantic City, not to AFS Headquarters in Des Plaines. You can always cancel without cost or obligation if you change your mind.

■ Register in advance. Use of form on page 21 of the February issue enables you to bypass registration in Atlantic City. You can thus enter exhibits and meeting rooms without delay because you'll already have your badge.

All company and sustaining members of AFS may register *any* of their employees at the member rate of $2.00. Non-member registration is $5.00. Exhibitor representatives *who will be manning booths* will be registered gratis through blanket registration made by exhibiting companies.

1956 Castings Congress paper authors and speakers, and bona fide students are not required to pay a registration fee.

Advance registration offer closes April 23.

■ **Contact promptly** the individuals you hope to see at the Congress and arrange to get together in Atlanic City. At the Congress, look up those you forgot to contact in advance by referring to the daily Registered Attendance List that will be posted each morning.

■ **Don't waste** the lunch and dinner hours. If a scheduled mealtime event doesn't interest you, make a date with someone you want to talk to, with an old friend, or with a new one you met at the Castings Congress.

If it's just going to be a social get-together, remember you can be sociable at a round table luncheon or a dinner meeting, and pick up a few worthwhile ideas in addition. The following luncheons are scheduled:

Brass & Bronze	May 4
Malleable	May 4
Manpower	May 4
Hoyt Memorial Lecture	May 5
Light Metals	May 7
Gray Iron	May 7
Industrial Engineering-Costs	May 8
Pattern	May 8
Steel	May 9

Dinner meetings planned are:

Sand (CO_2 process and core blowing)	May 5
Management (community	

My gosh! Just remembered I haven't registered for the AFS Castings Congress yet!

relations and air pollution) May 8

■ **Good ideas** you gain won't all come out of the formal papers presented. Bull sessions, chats on the boardwalk and the exhibit floor, shop course sessions, discussion of papers, all can contribute to your knowledge and know-how. Shop course sessions will be held as follows:

Gray Iron	May 3, evening May 4, afternoon
Brass & Bronze	May 5, afternoon
Malleable	May 5, afternoon
Sand	May 7, evening May 8, evening
Metallography	May 7, evening May 8, evening

■ Social events are important too. AFS has provided for them, remembering the old adage: "All work and no play, _____" —choose one—(1) makes jack the dull way; (2) makes Jack a dull boy; (3) makes jack.

There's the *Annual Banquet* the evening of Friday May 4 with Dr. Norman Vincent Peale as principal speaker. Other banquet features include presentation of AFS gold medals and honorary life memberships.

Ladies Program, in addition to the annual banquet, includes the traditional AFS Tea, luncheons, special ladies activities, and a "strip tease" style show.

Canadian Dinner, traditional gathering of the clans from north of the border, is set for the evening of Sunday May 6. Dinner will be preceded by a reception.

Authors Breakfasts combine business with pleasure as speakers and session chairmen get together to get better acquainted and to get their special instructions for the day. First meeting will be a luncheon Thursday May 3 a 12:00 noon because technical sessions do not start until 2:30 pm the first day of the Castings Congress. Other meetings will be held at breakfast 7:30 am on May 4, 5, 7, 8, and 9.

AFS Alumni Dinner, annual function of the "Official Family" of the society—present and past officers, directors, medalists, honorary life members—will be held the evening of Monday May 7.

TAKE A "PEEK"

at what May 3-9 Offers You!

. . . then, you'll see why EVERY Progressive Foundryman will be in Atlantic City for the 60th AFS Castings Congress Show.

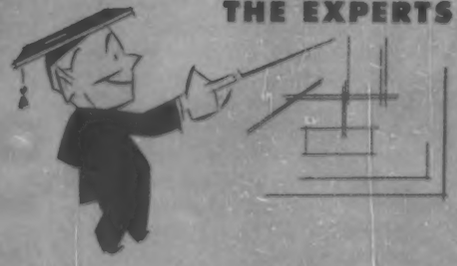
WHICH IS BETTER?

It's easier to select equipment, materials or special services, when you can compare at close range. The AFS Castings Congress and Show permits "on the spot" comparisons and choice of the one best suited to your individual requirements.

TEST THEM YOURSELF

Is your plant using equipment, materials and supplies that are suited to your operation? Are you fully informed on the latest models . . . the newest developments . . . the latest techniques? The AFS Castings Congress and Show will make it possible for you to *try out* the hundreds of new and improved products that will be on display in *"The Foundry of Tomorrow."*

LISTEN TO THE EXPERTS

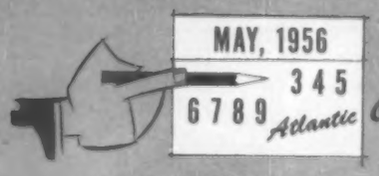


A diversified technical program, featuring recognized leaders of foundry thought and technique, will cover all of the newest developments in the production and processing of cast products. Be on hand to "STOCKPILE" your share of technical-practical foundry knowledge!

DO IT THIS WAY!

There's always a way to "do it better". . . come to Atlantic City, May 3-9, and talk over your problems with scores of technicians and engineers on duty throughout the Congress. They'll demonstrate their equipment for you . . . help you reduce the work load . . . be more efficient. What's more, they'll all be there, *under one roof,* waiting to welcome and serve you.

MARK YOUR CALENDAR
MAKE YOUR RESERVATIONS



✓ **EVERY foundry company will benefit by being represented.**

✓ **EVERY foundryman will take an added value by being there!**

AFS CASTINGS CONGRESS & SHOW

Sponsored by American Foundrymen's Society

GOLF & WOLF ROADS, DES PLAINES, ILLINOIS

"IT COULDN'T BE DONE!" But Small Brass Shop Mechanized Anyway

VERN CARLSON / *Technical Writer*

Systematic modernization increased casting quality, cut scrap, and improved working conditions for six molders

■ This is the story of a small bronze foundry which modernized step-by-step, paying for each improvement as it came along. The most recent and major step was a mechanized sand, mold, and casting handling system for six production molders. Right off the bat, they were told that it was impossible to mechanize for eight molders, much less six. But by the time they were through, mechanization paid off for six molders making 1000 molds per 8-hr-day.

Superior Brass Works, Inc., Detroit, specializes in casting and machining sleeve bearings and bushings of leaded red brass, gun metal, leaded gun metal, phosphor bronze, high leaded tin bronze, and manganese bronze. Aluminum bronzes are not handled because there is not enough floor space to provide the complete segregation required to avoid contamination of other bronzes.

Although Superior's special service is to sleeve bearing and bushing users, they cast anything that can be handled in their 12 x 20 x 3 x 3-in. standard flasks and does not require surface finishes beyond the ability of the system sand.

■ The first step in modernization began four years ago when G. F. Langford took over the reins as president and replaced an old, manual, rotary, oil-fired melting furnace with a 1000-lb oil-fired automatically oscillating, rotary melting furnace. Together with a companion furnace of the same capacity and six 250-lb pit-type, oil fired furnaces melting capacity was brought to 10 tons per eight-hour shift. The pit-type furnaces are used for melting limited amounts of bronzes.

The new furnace area, enclosed by walls except for an opening for metal distribution to the pouring area and another to metal storage, is exhausted by two roof mounted exhaust fans.

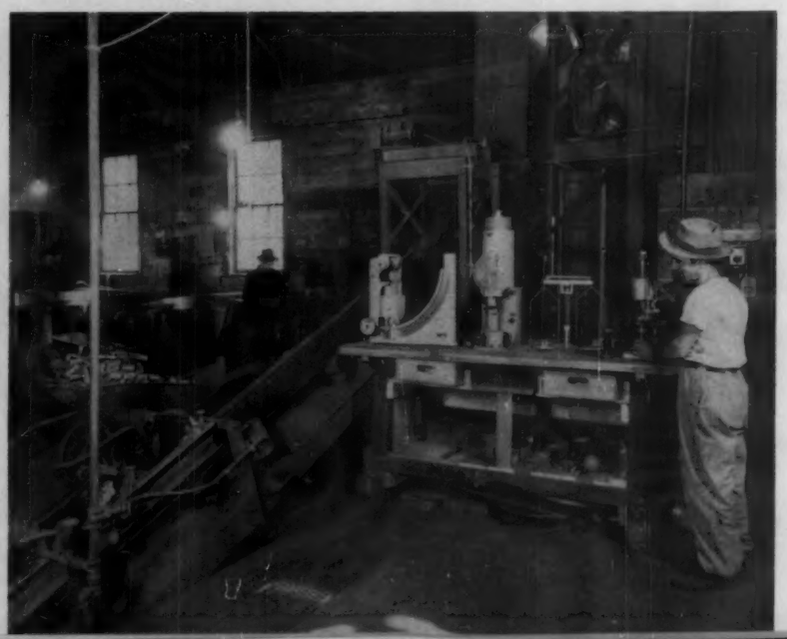
■ The second step was to achieve more accurate control of metal temperatures at both melting and pouring stages. The old time foundry practice of observing the color of the flame and the color of the metal had been used. However developing full SAE physical property specifications of tensile strength, yield point, and elongation every time required something more accurate than eye observation. The answer was obvious, and so pyrometers were purchased; first a semi-portable unit for the melting area and then fully portable units for the pouring area.

■ The third step, standardizing melting procedures, involved no purchase of equipment. Furnace charges consist of ingot, carefully segregated gates and risers from the company castings and carefully segregated borings and turnings from the company machine shop. No purchased scrap is used.

Established procedures should produce finished products conforming to SAE specifications. This, however, involves the human element of properly segregating returns as well as making up zinc that boils off zinc-containing bronzes. Adherence to physical property specifications also involves the human element of controlling melting and pouring temperatures and adding of proper amounts of phos-copper shot, as well as the maintenance of furnace atmosphere with critically exact amounts of air in the melting flames. Es-

Bushings are for machinery and materials handling equipment firms.

Automatically moistened sand is elevated to conditioning and storage.



pecially where the human element is involved there must be frequent checks or inspections.

Prior practice involved periodic checks of both chemical and physical analyses by an outside laboratory on a free basis. These checks were not considered to be often enough and if made more often would have involved considerable cost. Also expensive would be setting up their own metallurgical laboratory. The answer was the working out of a mutual assistance arrangement with a local business organization whereby that organization makes chemical analyses each day and a physical property analysis two or three times a week. These tests, at nominal net expense, assure strict adherence to SAE specifications, at no expense for laboratory equipment or added payroll.

■ Step four was to get more efficient use of fuel oil in melting and to speed up starting furnaces on cold winter Monday mornings. An oil preheater was installed in the section of the fuel oil system that gave trouble when the temperatures were low enough to cause blocking in the oil lines and inefficient use of oil.

■ Competitive conditions necessitating the reduction of foundry scrap to a minimum were met with step five, replacing 'feel" with sand testing equipment. "Feel" used to be good enough, but now it was necessary to accurately determine green strength, permeability, moisture content, and hardness.

■ Sixth step of the modernization program was to replace three coke-fired core ovens with one completely automatic temperature controlled, drawer-type, recirculating, oil-fired oven with twice the previous capacity. The old ovens were hand fired and required an employee to arrive early in the morning to light them. They were inefficient fuel users and could not be depended upon to provide uniformly baked cores. The result was high fuel cost, core scrap, and casting scrap. The new oven provides vastly improved cores and working conditions, at a lower fuel cost.

■ Step seven was to improve core quality and reduce core mixture costs by replacing hand mixing with a portable sand muller. Binder consumption was cut two-thirds, casting scrap from core blows and core sand was practically eliminated, and core collapsibility was greatly improved.

Core making efficiency could hardly be improved. High production has always been a feature of the core room as only cylindrical cores are used and these are made with old, but efficient extruding machines.

■ The eighth and major step in modernization was the installation of a sand, mold, and casting handling system. According to Peter O. Jellby, Superior's chief engineer, the first problem was to decide among completely automatic systems of the 150 to 300 molds per hour variety, shell molding systems, and individual molding machine sand casting systems.

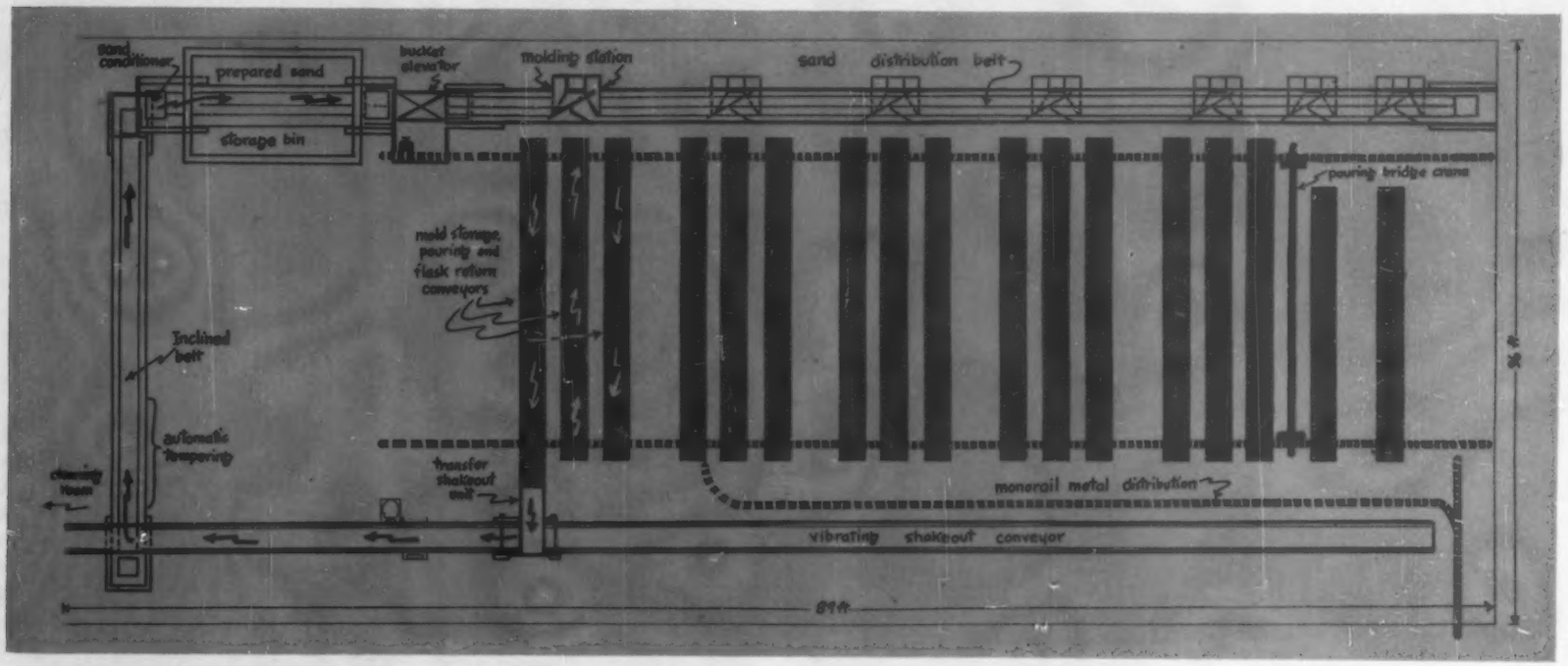
Automatic systems were not practical because of cost and excessive capacity. Shell molding was not practical for bushing production because the usual advantages of shell molding do not apply to bushing manufacture. The individual molding machine system fitted the limited budget and made use of existing molding machines.

Having decided upon the general type of system to be installed, equipment suppliers were asked to bid on a system based on a cost and performance specification. Also consulted were a number of service experts available on a courtesy basis to bronze foundries.

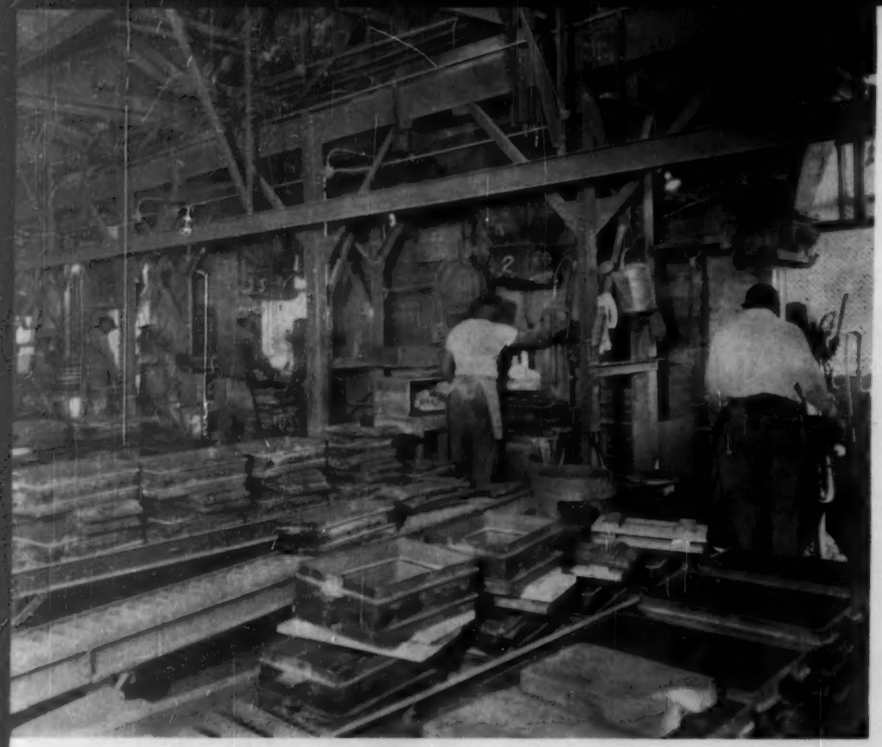
Objections to cost and performance specifications were plentiful. Superior was told that a foundry could not be mechanized for less than eight molders, that the minimum cost would be $15,000 per molder (about three times the total budget that had been set up), and that the available floor space of 36 x 96 ft was too small. One organization refused to submit any proposal at all, stating that the cost and performance specifications were not realistic.

Although cost was the main objection to the proposals, other objections were lack of mold capacity and lack of sand storage, which would have resulted in a hot sand problem and would not have allowed time for self tempering. It took about a year to arrive at a proposal that incorporated desired features and came within cost specifications.

Although the system fits a modest budget, none of its components can be considered inferior as all are recognized brands designed for long wear in foundry service. Included are: a 600-cu ft prepared sand storage bin; bucket elevator and belt sand distribution system to overhead hoppers at each molding station; gravity roll mold storage, pouring, and flask return con-

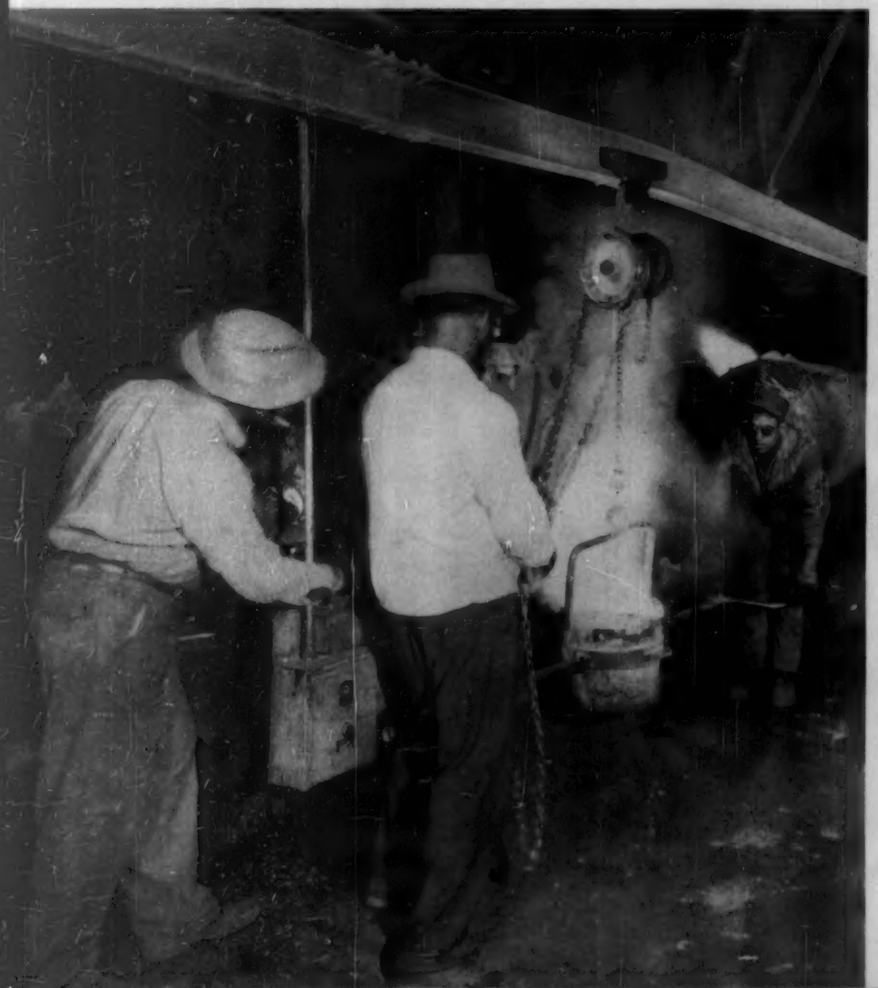


Alternative to mechanizing sand, mold, and metal handling in the 36 by 89 ft molding bay was—moving the plant.



Sand is distributed to each station by lowering and raising overhead plows.

Plant modernization began with this automatic rotary furnace.



veyors; above-floor oscillating, casting and shakeout sand conveyor across the ends of all mold conveyors; casting-sand separator; automatic moistening system; sand conditioning unit; and two bridge cranes for pouring.

When a molder needs molding sand he merely lowers a plow at his station to set sand distribution equipment in action. Prepared sand feeds automatically from the main storage bin through the elevator onto the overhead distribution belt and is plowed into the molder's overhead hopper. A bin level indicator signals the molder by red light when the hopper is full. He then shuts down the equipment by raising the plow. Overflow sand from the end of the distribution belt is transported to the oscillating, casting-sand conveyor by manual labor to put it back into the system. Mechanical handling of this sand is a "frill" that is scheduled for addition at a later date.

Seven previously used molding machines are in line along one side of the molding area. Six of them are jolt-squeeze machines. The seventh is a jolt rollover for making drags in conjunction with the adjacent jolt-squeeze machine used for making copes. Because the rollover is often set up with 4 and 5-in. drags, molds for "oversize" castings can be made at this station. Molds with green sand cores ordinarily are produced at the rollover station.

Each molder used to carry every mold 10 to 20 ft to stationary mold racks. Now he merely turns around to place molds on one of a pair of 20-ft lengths of gravity roll, storage and pouring conveyors. Another gravity roll conveyor is arranged between each pair of mold conveyors for returning empty flasks to the molder. Three-foot aisles between groups of conveyors allow for pouring and bringing in cores.

A monorail metal distribution and pouring arrangement includes two suspended bridge cranes for pouring off two areas simultaneously. A second ladle may be switched to a spur and pushed down the aisle inside the oscillating conveyor to a second monorail bridge for pouring off the far end of the mold storage area.

Specially designed shakeout units straddling the oscillating conveyor have a section of roller conveyor to bridge the four-foot aisle between the ends of mold storage conveyors and the oscillating conveyor. The bridge section is hinged so that it can be lifted to clear the aisle for metal distribution and other traffic.

V-grooved wheels running on floor-level rails of edge-up angle iron (one on each side of the oscillating conveyor) allow shakeout units to be pushed along the oscillating conveyor to line up with any mold conveyor. Two shakeout units are sufficient to handle the six pouring areas.

Shakeout action consists of rolling a mold onto the shakeout bridge unit, and then tipping the mold over onto a dumping frame directly over the oscillating conveyor. Because mold sizes are standard, only one frame opening size is necessary and both shakeout units are interchangeable.

Allowing the mold to fall upside down on the shakeout frame develops enough inertia to dump casting and sand onto the oscillating conveyor. When the operator turns to place the empty flask on the return conveyor he is in position to move another mold to shakeout. The two shakeout men also handle mold weights.

Selection of the oscillating casting and used sand conveyor is an example of how savings were made. A heavy duty conveyor at over three times the cost of a light duty conveyor had been recommended, but it was calculated that the light duty conveyor should do the job. It was learned that two other identical installations in the east were successful. The light duty conveyor was installed at a considerable saving in cost.

The oscillating conveyor is 85 ft long and 18 in. wide with one drive. Castings flow over a grid at the outlet end while sand falls through to a 14-in. inclined belt conveyor where it is moistened automatically as it is elevated to the sand conditioning unit. Self moistening is brought about by sand lifting a control lever as it passes under a water spray system. The conditioning unit is a belt-type machine that blends, aerates, cleans,

and throws mixed sand into the sand storage bin from which sand is fed to the molders as needed.

Testing sand twice a day for moisture, green strength, and permeability has proved a sufficient control on the new system. However, immediately after installation, tests were made four to six times per day. As the operator became familiar with the behavior of the system, fewer tests were necessary.

In designing the new system, excavation was held to a minimum. Utilities were rearranged and a new foundry floor was poured. Slight alterations were made to the building. At the same time molding machines and melting furnaces were completely overhauled. The entire transformation was made in three weeks, two of which were during vacation shutdown.

As things stand now, Superior is extremely pleased with increased production, lower scrap, and lower costs; and employees are pleased with better working conditions and reduced physical requirements. Yet this small bronze shop, aggressively following progressive policies, will continue systematic improvements toward higher casting quality and better working conditions.

Mobile shakeout devices bridge the gap between mold and shakeout conveyor and allows the operator to move molds and flasks without strain.

Aluminum on Celluloid

Present-day uses for aluminum and the production techniques for casting, rolling, extruding and deep drawing of the metal are reviewed in a 16-mm, sound and color film, *"The Chemistry of Aluminum."*

Designed primarily for college classroom use, the movie explains the mining and purification of bauxite for production of alumina. It also covers the electrolysis of alumina in molten cryolite for the making of metallic aluminum. The production of chemicals, such as hydrated, calcined and activated aluminas is also detailed.

Showings of the picture may be arranged by contacting the Motion Picture Dept., Reynolds Metals Co., 2500 S. Third St., Louisville 1, Ky. There is no charge for the showing.

casting | through the ages

TO GET IRON TO PRODUCE CASTINGS, KENTUCKY'S BOURBON FURNACE, BUILT IN 1791 ON SLATE CREEK, WAS OBLIGED TO PROVIDE RIFLEMEN TO KEEP INDIANS FROM ATTACKING WORKMEN DIGGING UP ORE FROM NEIGHBORING BOGS.
A regal tribute, INDEED, WAS THE 30 POUNDS OF WOOTZ STEEL GIVEN TO ALEXANDER THE GREAT ABOUT 400 BC BY KING PORUS OF PUNJAUB. WOOTZ STEEL WAS MADE IN CRUCIBLES BY THE CRAFTSMEN OF INDIA THOUSANDS OF YEARS BEFORE THE ART WAS KNOWN TO WESTERN NATIONS.
Odd
...THE AVERAGE SANDSTONE HEARTH USED IN ENGLISH FURNACES OF THE 1670'S STOOD UP FOR FORTY WEEKS. A BRAND-NEW HEARTH PRODUCED A SOW 600-700 POUNDS IN WEIGHT; BUT UNDER THE FORCE OF FIRE, CONTINUALLY BLOWN, IT GRADUALLY WIDENED UNTIL—NEAR THE END—IT HELD ENOUGH METAL TO PRODUCE A 2,000 POUND SOW.
Bits
AT THE BEGINNING OF THE CHRISTIAN ERA, A SCULPTOR NAMED ZENODORUS WON FAME IN ROME FOR MAKING A BRONZE CASTING OF THE EMPEROR NERO 115 FT. HIGH.

CUPOLA

■ Here's how one foundry met the problem of providing more molten metal to meet the requirements of increased iron casting production. Electromagnetic metal charge make-up, revamped coke and limestone handling, and skip charging now supply the cupolas with charges fast enough to maintain the desired melting rate. Improvements also eliminated much of the human effort connected with these operations and greatly improved working conditions.

A ready supply of molten metal for increased production involves both melting and charging facilities that must satisfy basic production and metallurgical requirements.

Cupola production, concerned primarily with the rate of charge make-up and charging, is deter-

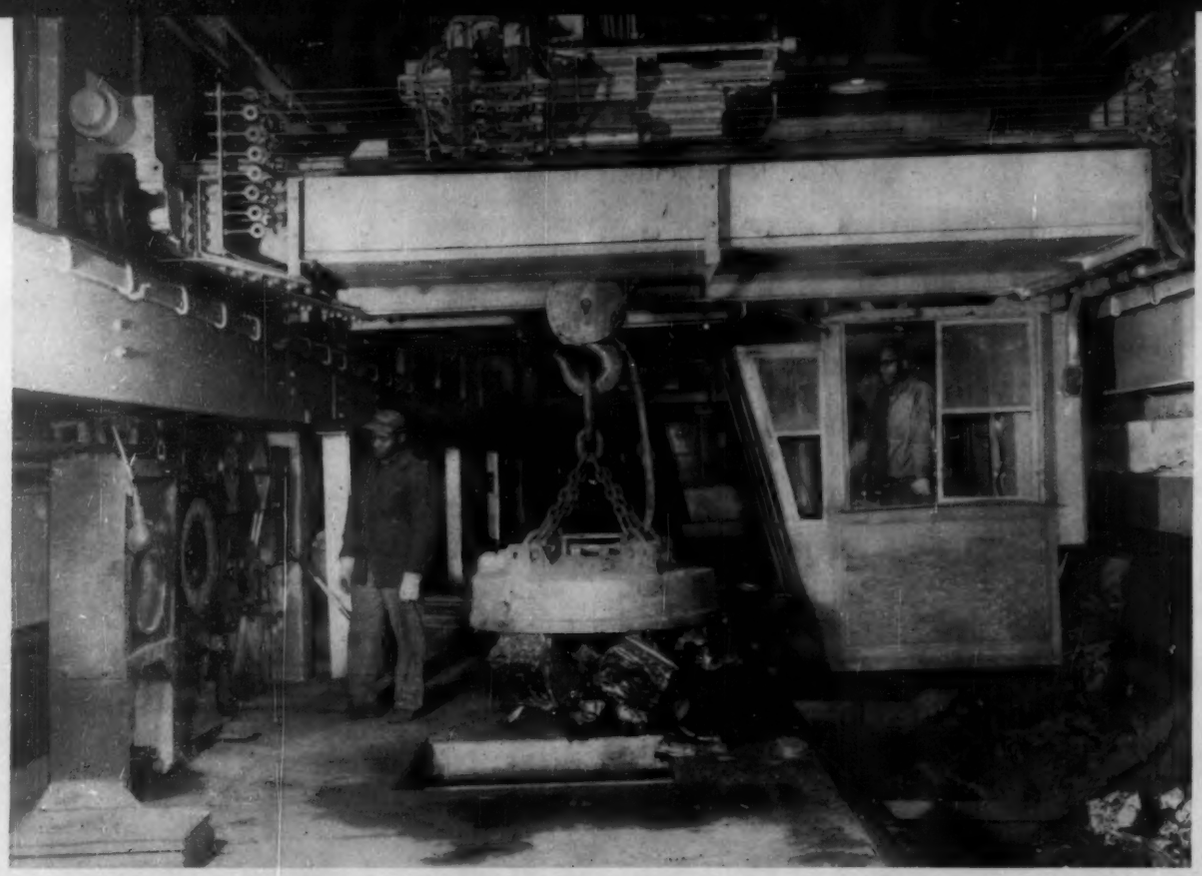
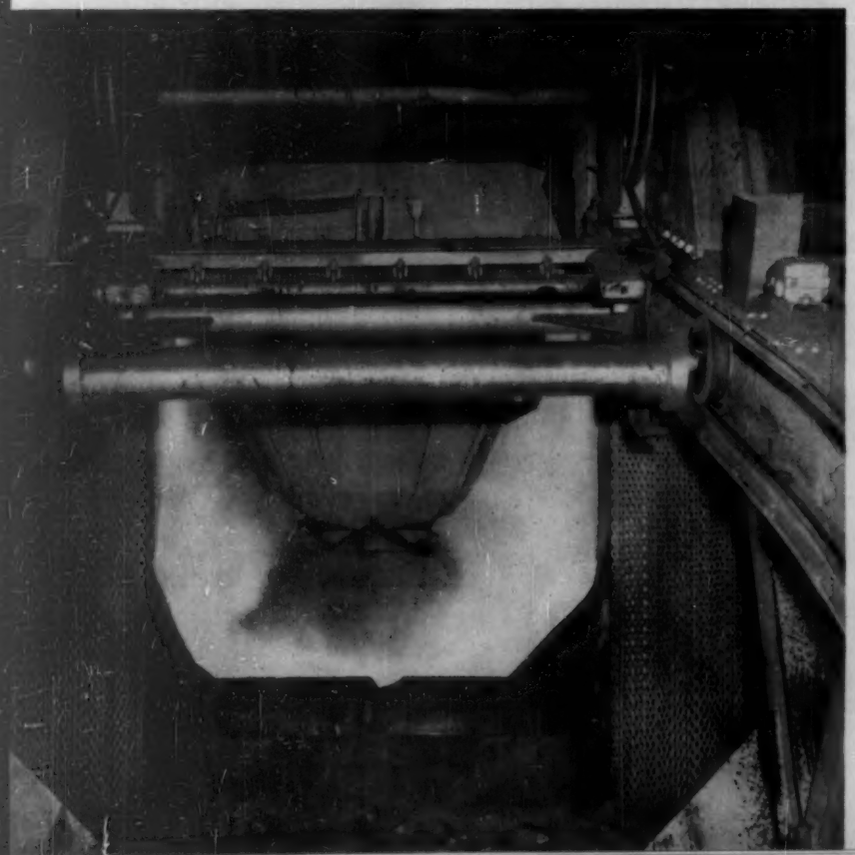


Fig. 1 . . Five-ton crane will start scrap on its way to a cupola by releasing it into this weigh hopper.

Fig. 2 . . Cone-bottom charging bucket rolls up to cupola on skip charger.



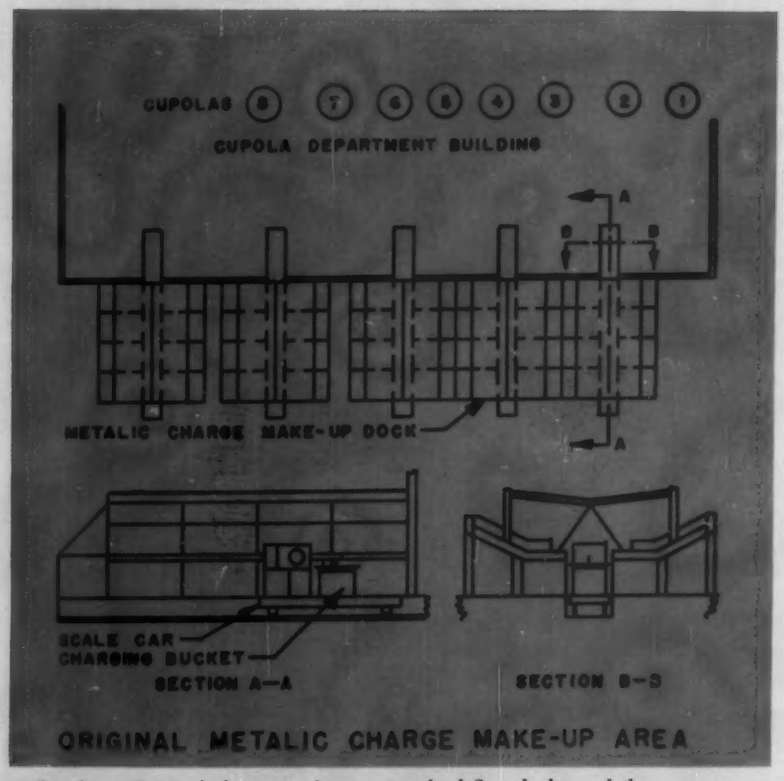


Fig. 3 . . Original charge make-up area had five docks and three cranes.

CHARGING SPEEDED TO BREAK PRODUCTION BARRIER

H. G. McCallum
Pontiac Motor Div.
General Motors Corp.

If production demanded it, could you melt more iron in your present shop, without new cupolas and with less labor?

mined by the melting rate. Under normal conditions the metal charging rate is equal to the cupola melting rate; fluctuations in charging alter the melting rate.

Metallurgical requirements of a charging system concern principally the weight accuracy of charges. To obtain molten iron of desired chemical and metallurgical composition, the weight of each metallic material must be specified. Likewise, each coke and limestone charge must be weighed exactly to produce molten iron at the desired rate, temperature, and slag fluidity.

Another metallurgical requirement pertains to metal charge cleanliness. Foreign material such as sand on gates, runners, and sprues increases the amount of slag produced in melting, requiring more limestone to maintain slag fluidity and to neutralize sand acidity. An efficient charging system must be capable of producing metallic charges containing less than one percent (by weight) of foreign material.

The cupola department of Pontiac's foundry was recently faced with the problem of putting out 90 tons of iron per hour to meet an increase in casting production. To do this, cupola charging would have to be accomplished in 2½ min cycles.

The location of the cupola department with respect to the rest of the foundry made it impossible to add to the number of cupolas or to the size of the building.

Survey Present Facilities

Melting facilities consisted of six 102 in. diameter cupolas lined to 66 in. at the melting zone and two 108-in. cuploas lined to 75 in. All were designed for rear slagging and were tapped directly into bull ladle transfer cranes. Because space does not allow the use of holding ladles, charge make-up accuracy is all the more important.

At the time of the survey, two 102-in. cupolas and one 108 were operated simultaneously while three others were readied for the next day's operation. Cupolas were grouped in pairs: 1-2, 3-4, 5-6, and 7-8. Cupolas 1, 3, and 7 were operated one day; 2, 4, and 8 the next; 5 and 6 were kept in reserve. Three cupolas could not put out the needed additional metal so a fourth would have to be put into simultaneous operation and the charging system made adequate.

The department is housed in a three story building that is an integral part of the foundry building. Slagging, tapping, and control operations were performed on the first floor. There, also, were scale cars and transfer trucks used in conjunction with charging. Outside on this level was the metallic charge make-up area.

The second floor held five centrifugal-type cupola blowers. The following equipment was on the third floor: four coke and limestone weigh hoppers; eight 3-ton, rail-mounted, cupola charging cranes; and coke and limestone charge-transfer trucks.

Located within the storage-yard area adjacent to the building were bins for foundry, malleable, and regular and precision cast silvery pig irons; cast iron and steel scrap; steel bales; and cast iron and steel briquettes. Briquettes were formed in a separate building in the yard area.

Precision cast silvery pig is a constant analysis, electric furnace silvery iron supplemented with chromium, nickel, and manganese and cast into piglets of uniform weight.

Three 10-ton bridge-type yard cranes transferred metallic charge

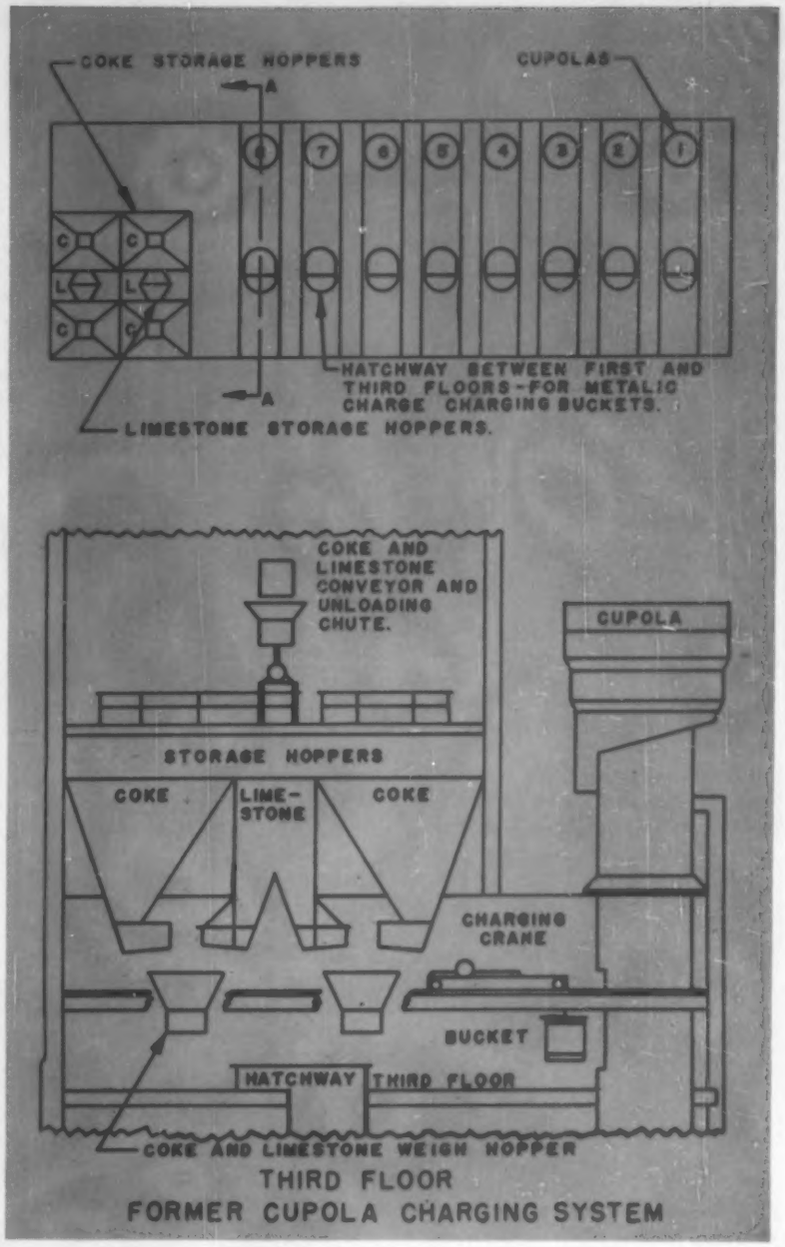


Fig. 4 . . Coke and limestone charges were trucked to the cupola charger.

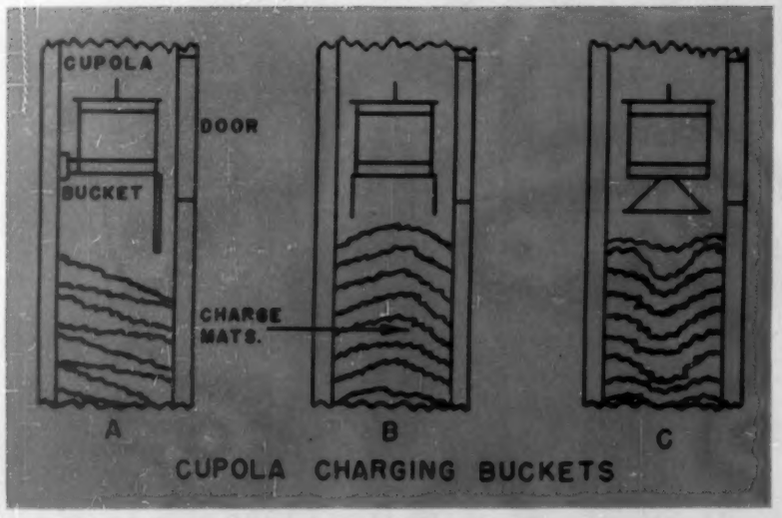


Fig. 5 . . New buckets combine characteristics of these three basic types.

materials to five "docks" where hard- and soft-iron charges were made up (Fig. 3). One dock was used to store silicon, manganese, chromium, and phosphorous ferroalloy briquettes used in special charges. Hard iron charges were made up at two docks and soft iron at the other two.

Eight inclined bins gravity fed materials for a specific type charge to the dock's flat work area. Make-up operations, similar for both irons, consisted of spotting a rail-mounted scale car so that the charging bucket could take on charge components from bins along the dock.

Because silvery pig is an important metallurgical control material, it was weighed more accurately on a 500-lb platform scale before being loaded into the bucket.

When all materials were loaded, the scale car moved into the cupola building where a transfer truck replaced the loaded bucket with an empty one and the make-up cycle was repeated.

The loaded bucket was moved by transfer truck to a pick-up point under a hatchway extending from the third floor to which the charging crane raised it by hook and cable and emptied it into the cupola. This sequence was performed for each cupola in operation.

The cupola charging cycle followed the standard practice of supplying alternate charges of coke and limestone combined as a single charge.

Coke and limestone were unloaded separately from railroad cars into a pit-type hopper in the storage-yard area. They were conveyed separately by belt to four coke and two limestone storage hoppers above the charging floor (Fig. 4). At the end of the belt was a special chute for directing materials into the proper hoppers.

Before reaching storage coke passed over a 1-in. wire mesh screen to remove fines and small coke particles, dust, and undesirable foreign material. A steel plate covered the screen when limestone was conveyed to storage.

Connected to the bottom of the storage hoppers were electrically vibrated chutes which moved materials to weigh hoppers. Each coke storage hopper supplied one weigh hopper and each limestone storage hopper supplied two weigh hoppers. By means of internal scales, these hoppers weighed automatically the quantity of coke and limestone required for each regular cupola charge. They could also be operated semi-automatically to accommodate an occasional variance in the amount or either component.

Coke and limestone were then dropped into charging buckets and transferred by truck to where the crane could pick them up and charge the cupola.

System Selection

When the survey of the existing cupola charging system was completed, an analysis was made of its characteristics. At the same time an overall study was made of make-up and charging operations and equipment used through the foundry industry.

The existing method for metallic charge make-up was essentially manual in nature. The possibility of decreasing make-up time with electromagnetic methods was studied. This method uses an electromagnet to load metallic materials directly into scale-mounted charging buckets or into a weigh hopper from which buckets would be loaded.

Equipment for the electromagnetic method is usually "tailor-made" for a particular cupola operation and requires consideration of type and size of materials, number of different materials in a charge, weight tolerance for each material, location of make-up area, type of charging equipment, and time available for make-up.

On the basis of a favorable analysis of the electromagnetic method, it was selected for the new charging system.

Attention was directed next to coke and limestone charge make-up operations. Conveying these materials from pit hopper to storage was deemed satisfactory.

Coke and limestone can be measured by weight or volume. The weight method measures the total mass of the material, including moisture; material size and shape have no effect on this measurement. With the volume method, material size and shape (but not moisture) affect the amount measured. The existing method for measuring by weight was considered suitable for continued use.

Before studying coke and limestone transfer, various cupola charging methods were investigated. Careful consideration was given to the charging cycle time for each method.

Manual, truck, and conveyor charging methods were considered undesirable. The amount of material involved made the manual method impossible. Charge weight was too heavy for handling by either a crane-type truck equipped to handle any type of charging bucket, or a lift-type truck using a special dumping skiff for a charge container.

Conveying materials directly from make-up to cupola would require relocating make-up from first to third floor and elevating the yard cranes. A conveyor system would be practical, however, for handling coke and limestone.

The method found feasible and accepted was skip charging which utilizes a trolley, mounted on fixed guide rails, to transport a charge container from make-up directly into the cupola.

One of the most important items of a charging system still had to be considered—the type of charging bucket to be used. The bucket is important because it determines how materials distribute inside the cupola.

The three most widely used cupola charging buckets are single-bottom door, double-bottom door, and cone-bottom buckets (Fig. 5). The existing charging system used double-bottom buckets for coke and limestone and cone-bottom buckets for metal.

Skip charging calls for all materials to be charged simultaneously and means the bucket must work well with the system as well as effectively distribute the charge in the cupola. The square top, side opening, cone-bottom type of bucket was selected because it compromised the advantages and disadvantages of other types of buckets. Each cupola would have its own skip charger, equipped with a bucket large enough to handle one regular metal charge, two regular coke charges and two regular limestone charges at the same time.

Improved Charging System

Figure 6 is a plan and elevation view of the new metallic charge make-up area. The five docks were replaced by 20 inclined chutes which guide materials into 20 storage bins. The bins are separated into two groups each with materials for two pairs of cupolas. Two bins, containing regular and precision cast silvery pig irons are centrally located to supply all eight cupolas.

Metallic materials are transferred from the storage yard by the 10-ton yard cranes. They are moved from the bins to eight weigh hoppers (one for each cupola) by two 5-ton bridge-type cranes, each equipped with a 45-in. diameter, electromagnetic lift.

One 5-ton crane supplies the weigh hoppers for cupolas 1 through 4 while the other serves cupolas 5-8. A third crane is available for emergency use and for lifting nonmetallic materials through the hatchway from ground to charging floor.

Coke and limestone storage hoppers and the conveyor for transporting these materials to storage were retained. A change, however, was made in handling them from storage to cupola.

Figure 7 shows plan and elevation views of the nonmetallic charge make-up area. Coke and limestone handling centers about transferring them from storage hoppers to supply hoppers and finally to weigh hoppers. Each cupola has its own coke and limestone supply and weigh hoppers which receive materials by—truck mounted hopper.

The scales and vibrating chutes on each coke storage hopper were removed and the pneumatically operated, clam-shell-type bottom doors were lowered. Limestone storage hoppers were altered so that each hopper feeds into one set of unloading gates. One truck driver operates the manual unloading gates to load the transfer truck and delivers the material to the proper supply hopper.

Make-up and Charge Procedure

Make-up and charging procedure is similar for each cupola. The overall system is based on supplying charges for cupolas 1, 3, 5, and 7 one day; the even numbered the next; however, any arrangement can be used. Figure 8 is a schematic elevation view of the charging arrangement for one cupola.

Metallic materials stored in the group of bins supplying a pair of cupolas are loaded separately into the weigh hopper by the 5-ton electromagnetic lift crane. The crane operator determines the weight of each material loaded into the hopper by observing a nearby wall-mounted, dial-face scale.

The two silvery pig irons are stored in piles on the make-up platform near the weigh hopper and are loaded by hand. Regular silvery pig is accurately weighed on a platform scale before being added whereas, metallurgically constant, precision cast silvery piglets, all being the same weight, are added by number.

After all metallic materials have been loaded, hopper bottom doors are opened pneumatically to empty into the charging bucket positioned directly below. An operator then sets the skip charger into operation, moving the charging bucket upward until it stops automatically beneath the coke and limestone weigh hopper.

The skip charger utilizes a trolley to transport the charging bucket. Two steel cables, wound around a steel drum powered by an electric motor and gear reducer arrangement, raise and lower the trolley along fixed guide rails.

The coke and limestone weigh hopper receives material from its own coke and limestone supply hoppers. Supply hoppers, in turn, receive material directly from the transfer truck. Coke and limestone are semi-automatically loaded, separately into the weigh hopper.

To make up a coke and limestone charge, the operator transfers each material separately from its supply hopper to the weigh hopper by means of electrically vibrated chutes on the supply hoppers. When the desired amount of coke has been loaded into the weigh hopper, an automatic scale mechanism shuts off the coke-chute vibrator and sets a similar vibrator on the limestone hopper into operation. The scale again automatically stops the flow of limestone when the correct amount has been added. Limestone may be loaded before coke if desired.

The charge of coke and limestone is then emptied directly on top of the metal in the waiting charging bucket. The skip charger is set into operation and the bucket moves into the cupola and deposits its charge. The skip charger then returns the bucket to the metallic materials weigh hopper to complete the cycle.

Charge make-up operations are continuous; charges are dropped into the bucket immediately upon positioning.

Condensed from "Development of an Improved Method for Cupola Charging to Meet Increased Production Requirements," *General Motors Engineering Journal*, v 2, no. 6, report of McCallum's thesis for his degree from General Motors Institute, Flint, Mich.

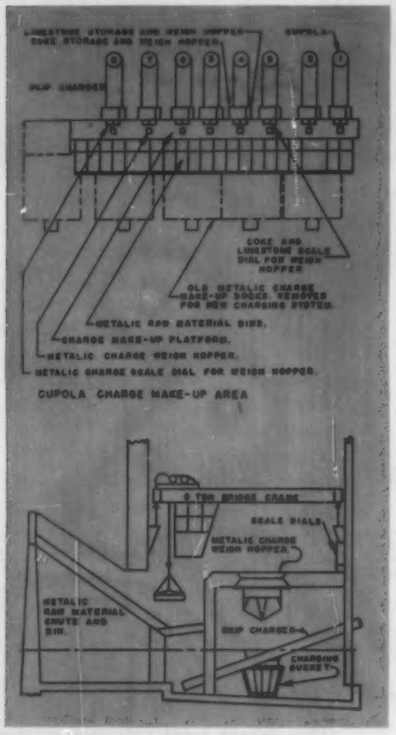


Fig. 6 . . Chutes replaced docks.

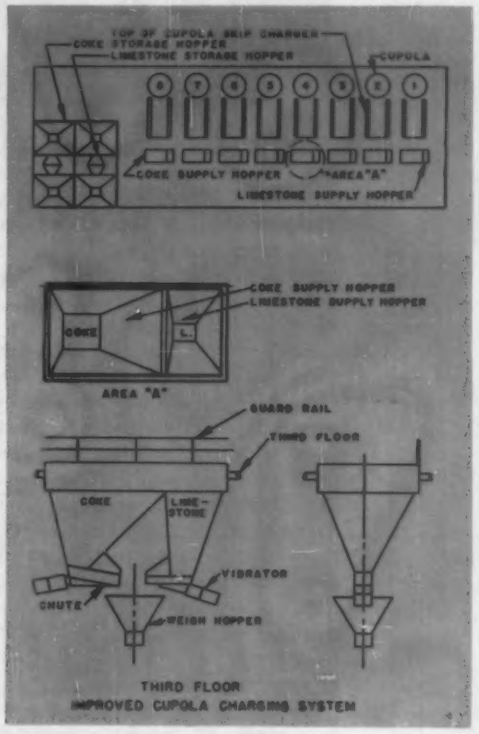


Fig. 7 . . Cupola has own storage hoppers.

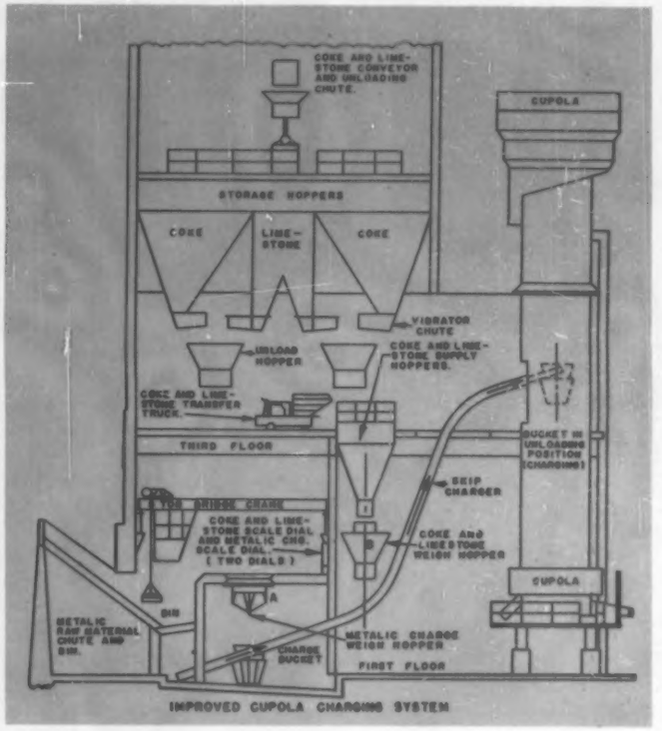


Fig. 8 . . System increased production and reduced man-power.

Fig. 1 . . Overhang test is accomplished with cam-actuated jolt-machine.

MORE REVEALING GREEN CORE TEST

Results with new technique predicts sand mixture properties

E. C. Zuppann / *Foundry Engineer*
Oliver Corp., South Bend, Ind.

H. Putz / *Sand Technician*
Oliver Corp., South Bend, Ind.

■ There is no news in the statement that the compression test for green core sand gives little useful information. The news the authors want to present is that they have refined and adapted the green core impact test to give accurate, reproducible results with a minimum of effort, care and time.

It has been found that testing the ability of the green core to support overhang reveals more than any other green core test and also shows conditions that no previous test had shown.

In the compression test, sands that will not make a satisfactory core may test higher than sands that will. Sands that have deteriorated with long standing may test the same as ones that are fresh, but the old sand will not carry an overhang when made into a core. The compression test with core oils and cereals in mixes may give results radically different from those found in the core room. Mixes made with some core oils may deteriorate rapidly and become useless within a few hours without showing any effect upon the compressive strength.

In 1952 the sixth edition of the AFS Foundry Sand Handbook discussed the green core impact test as a non-standard test. The test was supposed to test the ability of a green core to: (a) resist sagging in handling, (b) resist cracking and spreading, (c) to support overhang. The series has been able to indicate core room workability, bench life and "coremakers acceptance." Of the three test phases, the test for ability to support overhang is the most sensitive and useful.

In making these tests the standard 2-in. diam x 2-in. high specimen is used with a test apparatus provided with a cam which raises and drops the specimen plate. The cam is turned until the core specimen shows a failure in the form of a crack, or by sagging or dropping of overhang. Because of the action of the test apparatus the authors prefer to call the tests "jolt tests." The tester includes a mechanical counter which indicates the number of jolts administered to the test specimen.

Background of Change

The first change introduced by the authors was to blow the briquet specimen. In the past, the authors had found that the most reproducible baked core tensile tests were obtained by blowing the briquet. The first briquets blown for tensile tests were made with a slotted head on a bench machine using a vent plate from production. As rough as these cores were, due to removing the slotted head, and with bumps from depressed vent screens, the results were above expectation. Twenty-four tensile cores were made. When tested after baking, all were within the required 10 per cent of the average. This showed that good clean equipment would give better results than the standard laboratory rammer. The equipment that was made is shown in Fig. 1. Further tests confirmed the reproducibility of results.

The excellent results experienced in blowing tensile specimens prompted the authors to investigate this method of preparing specimens for the jolt test. With the regular equipment which uses the standard laboratory ramner wild results were obtained on the jolt overhang test.

Equipment for Test

Fig. 2 shows the equipment used to blow the test specimens. It should be noted that the standard specimen tube is used. These may be purchased machined to a high degree of accuracy and surface finish. When making specimens for the jolt overhang test, the projection is made with the ring from the original equipment. Thus, the parts subject to wear are easily replaceable. The use of the spacer rings allows production of a two inch specimen for any of the three jolt tests or for the standard tests.

A 3/8 in. blow hole is used with a one inch 150 mesh vent. The sag test cover plate has four 1/8 in. and four 3/16 in. vent holes. This arrangement is used on the cover plate so as to present a solid center for the dial indicator to ride on. These holes also prevent the plate from sliding off during testing.

The blower used with this equipment is a standard bench blower. The air is supplied from the labora-

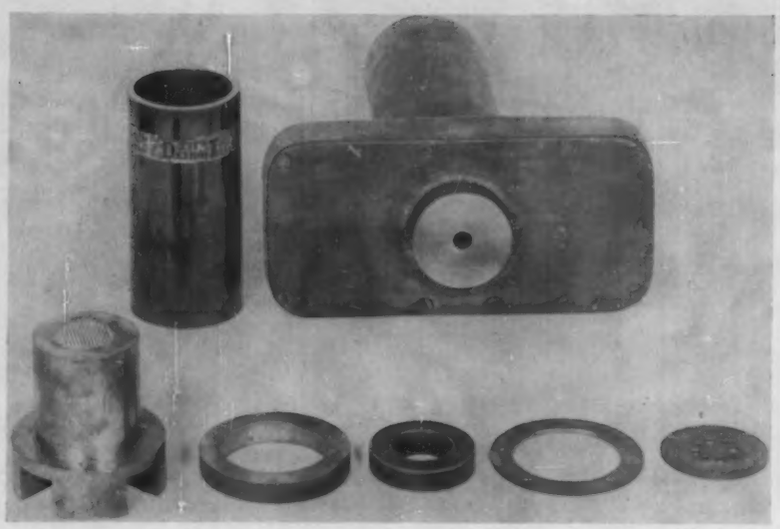


Fig. 2 . . Equipment for blowing specimens may be commercially produced.

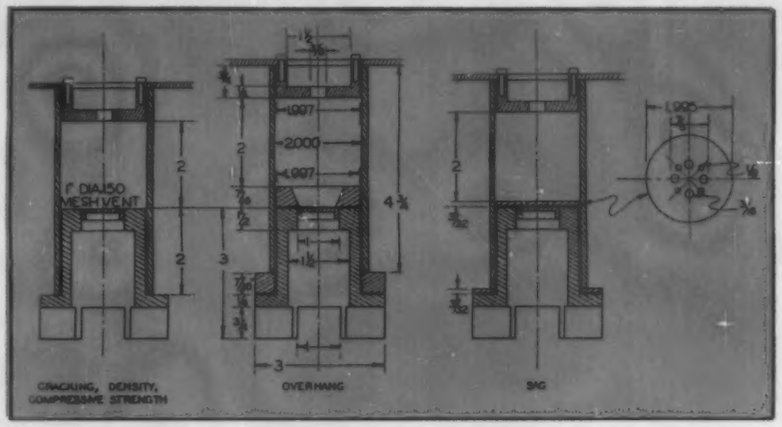


Fig. 3 . . Spacer rings allow production of specimens for several tests.

tory through a small pipe over a considerable distance. In order to obtain consistent specimens, it was necessary to operate the blower at a constant available volume and pressure.

A pressure reducer controls the air pressure slightly below the minimum line fluctuation, thus, assuring a constant pressure. A six cu ft accumulator was installed after the regulator to minimize pressure drop during blowing. The line between the tank and the blower was kept to a minimum. Tests have shown that small variation in air pressure gives a larger variation in test results. Weak sands and strong sands lose the same percentage of overhang strength with a drop in blowing pressure. An average of several tests shows the following:

Blowing Pressure	Overhang Strength
100 psi	100%
80 psi	74%
60 psi	52%
40 psi	38%

These results indicate both the relationship between overhang strength and blowing pressure and the effect of pressure variation.

How to Test

The equipment is used by filling the cartridge with sand, jolting slightly to settle. The cartridge is placed on the pedestal without the tubes and is blown to pack the sand. The cartridge is refilled with sand. In making a two inch specimen for density measurement, jolt cracking, or compressive strength, the tube is placed on the pedestal without a spacer ring, the head inserted, and the specimen blown with one shot of air. The blow head is refilled with loose sand after each blow.

To make a jolt overhang specimen the brass ring for making the extension and the corresponding spacer are placed on the pedestal. The tube is put in place. The head inserted in the tube and the specimen blown with one shot of air. In a similar way the jolt sag specimen is blown using a special cover plate and corresponding spacer ring.

The difficult operation in making a rammed jolt overhang specimen is the removal of the ring. Even with extreme care the projection may crack very slightly, resulting in the erratic low results that have hampered the acceptance of this valuable test. The illustrated equipment gives a long accurate draw through the use of the close fitting pedestal. This is reflected in consistently reproducible results that are not possible with the original equipment. Another advantage is the speed of testing by eliminating accurate weighing of sand before ramming. For shops that blow cores, this method of specimen preparation duplicates production conditions. A more realistic jolt sag test is also obtained.

When jolt overhang specimens were rammed the results were similar to the following:

Specimen Number	Jolts Before Failure
1	12
2	36
3	32
4	18
5	22

The same sand blown with the illustrated equipment showed:

Fig. 4 . . Small changes in line pressure vary test results considerably.

Specimen Number	Jolts Before Failure
1	35
2	34
3	34
4	35
5	35

It is interesting to note that the arrangement of blow hole and vent makes a firmly packed overhang extension that almost duplicates the best rammed specimen results. Blown sag test specimens show only a slightly greater sag than the rammed ones. This amounts to less than 10 per cent in most cases.

With blowing equipment the jolt overhang test has assumed increased significance. In all cases the results tally with the coremakers' opinion and the cores produced. The following examples are given to stir the interest of the reader and are backed by strong indications but not necessarily conclusive research proof.

Results of Testing

- A slight difference in timing of additions between two muller operators was found to change the jolt overhang from an average of 320 jolts to 95 jolts. This reflected the opinion the coremakers had regarding the abilities of the two muller operators.
- Core oils have been found to differ widely in their ability to carry an overhang. This may be a result of a reaction of the oil with the cereal. However, differences of from over 700 jolts on one oil to less than 100 on another have been experienced.
- Cereal binders have been found to differ widely among themselves with no oil added and also in their compatibility with various core oils.
- The deterioration or bench life of core sand with time (not drying) appears to be a function of the core oil. Mixes containing some core oils have been found to drop the overhang test from 500 jolts to 35 jolts in four hours while others may drop only to 400 jolts. The coremakers' opinion of the sand corresponded to the test. Compressive strength showed little change.
- Core mixes containing clay or bentonite, to increase the resistance to sag and green compressive strength, show little increase in overhang retention.

APPRENTICE TRAINING— How Labor and Management Cooperate in Tulsa

J. A. DEAN/*Mfg. Manager*
Nelson Electric Mfg. Co.
Tulsa, Okla.

■ Labor and management have joined forces in an unprecedented program to train foundry apprentices in Tulsa, Okla. The program not only represents an unusual degree of cooperation between a labor union and foundries but among the foundries themselves.

It took literally several years to spell out the program but the result is a curriculum of night classes conducted regularly by the Adult Education Division of the Tulsa Public Schools. The cost is paid half by the Oklahoma State Department of Vocational Education and one-fourth each by the Tri-State Chapter of the American Foundrymen's Society, and by Local No. 325, International Molders and Foundry Workers Union of North America.

Organization of the unusual plan is under the direction of the Tulsa Molders Joint Apprenticeship Committee consisting of one man from each foundry representing labor.

The committee's stated purpose is to provide supplemental training for all apprentices in the foundry industry in order to round out their experiences in some of the more technical phases of casting metals. The classes meet for two hours one night each week. The class is normally made up of apprentices, journeymen, helpers, foundry supply salesmen, management and other persons connected with the foundry business.

To receive a journeyman card now the apprentice must have spent four years in the trade, must have been indentured to the committee and the Federal Bureau of Apprenticeship, and must be approved by the committee.

Instructors of the classes are selected by the committee and are taken from the individual shops. Once the basic outlines of the course were agreed upon late in 1950, the program operated successfully. The schedule started to repeat itself in 1954.

Between January 1951 and June 1955, 16 completion certificates were issued and 16 apprentices dropped out—most because of tightening of expenditures by the VA. Total cost of the classes during this period has been $1,022.80, leaving a total investment per man of $63.93 for the four-year training course. Many of the other foundrymen attending the classes, of course, were not indentured and went only to obtain general information. At present 13 apprentices are indentured to the committee.

Here is the curriculum:

- **First year.** Sand and sand control, first semester; coremaking and green sand molding, second semester.
- **Second year.** Loam and dry sand molding, first semester; analysis of casting defects, second semester.
- **Third year.** Mixing and melting of metals, first semester; gating and risering of castings, second semester.
- **Fourth year.** Blue Print reading, first semester; patternmaking, second semester.

There is no doubt that the program is a success reports J. A. Dean.

THE NOISE PROBLEM IN FOUNDRIES

Recent court decisions make U.S. industry liable for billions in loss of hearing claims

A MODERN CASTINGS BONUS

Recent legal decisions have held industry liable for hearing losses by workers. Total compensation claims can run into billions. Yet industry is without experience or insurance reserves to meet the crisis. Some states have provided temporary relief but the basic problem still remains. It is explained in this special section prepared from material supplied by the Noise Control Committee of the American Foundrymen's Society.

HOW WE HEAR

■ Exposure to intense noise may cause impairment or loss of hearing and interference with communication. Only recently, however, has this subject received intensive scientific study. Many problems remain to be solved and much data on human hearing and noise exposure must be collected, analyzed and correlated.

HOW THE EAR WORKS

The ear is divided into three parts, the external, middle and inner ears. The external ear is of minimal value in collecting sound waves.

From the external ear, sound waves are routed down the external auditory canal, about one inch in length, and strike the ear drum, setting it in motion at the same frequency as the sound wave. The ear drum separates the external from the middle ear.

The middle ear is an irregular space a half inch in diameter, which contains a chain of three small bones popularly called hammer, anvil and stirrup because of their resemblance to these objects. The hammer is attached to the ear drum and receives vibrations which it transmits through the anvil and stirrup to the internal ear through the fenestra vestibuli (oval window).

The internal ear or labyrinth consists of a vestibule, the semicircular canals of balance, and the cochlea which is concerned with hearing. The cochlea is a snail-like coil about 1¼ in. long. It is the organ of hearing.

The vibrations of sound are received by the external ear and carried across the middle ear by the chain of small bones through the oval window to the fluid of the cochlea. The waves in the fluid are directly proportional to the waves of the sound in both loudness and tone. The fluid sound wave passes into the cochlea and transmits its vibrations to the hair cells of the organ of Corti where a nerve impulse originates and is conducted to the brain by the auditory nerve. The brain interprets the nerve impulses as sound.

THE EFFECTS OF NOISE

Intense sound or noise of sufficient intensity and continued for a sufficient time will cause loss of hearing. Sudden or blast-like noise of 150 decibels, when there has been no warning to prepare the middle ear through action of the middle ear muscles, may disrupt the ear drum, the chain of tiny bones, and the organ of Corti.

Noises of an intensity of 160 decibels are beyond the anatomical safety factors of the ear and cause immediate harm. Noise of about 130 decibels in animals, and presumably in man, may cause swelling of the hair cells of the organ of Corti on short exposure and destruction on longer exposure. These changes are usually localized rather than involving the entire organ, thus may involve destruction of ability to hear certain frequencies only.

In man, sound levels of 120 decibels produce discomfort; 138 decibels tickle, and 140 decibels produce pain. Clinically, the first and greatest damage to hearing caused by excessive noise is at about 4,000 cycles per second (cps) frequency.

Similar changes may occur in the natural degeneration of age. The extreme variability in individuals to noise damage and to age deterioration is but one of many factors requiring careful and long-time observations in man before they can be properly evaluated.

Because of this variability, it is impossible to set specific, safe and harmful limits of exposure. It is generally agreed, however, that air conduction levels of intensity below 85 decibels will cause no ear damage and levels above 110 decibels will cause damage on continued exposure. High frequency noises are more damaging than low frequencies.

One serious problem is the detection of noise-susceptible persons so they can be protected.

The intensity of noise, the vibration frequency, the length of exposure and the factor of individual tolerance are the most important factors influencing loss of hearing. However, the age of the person, presence of coexisting ear or respiratory tract disease, the influence of certain drugs or nutritional states, distance from the source of the noise, and so on are factors.

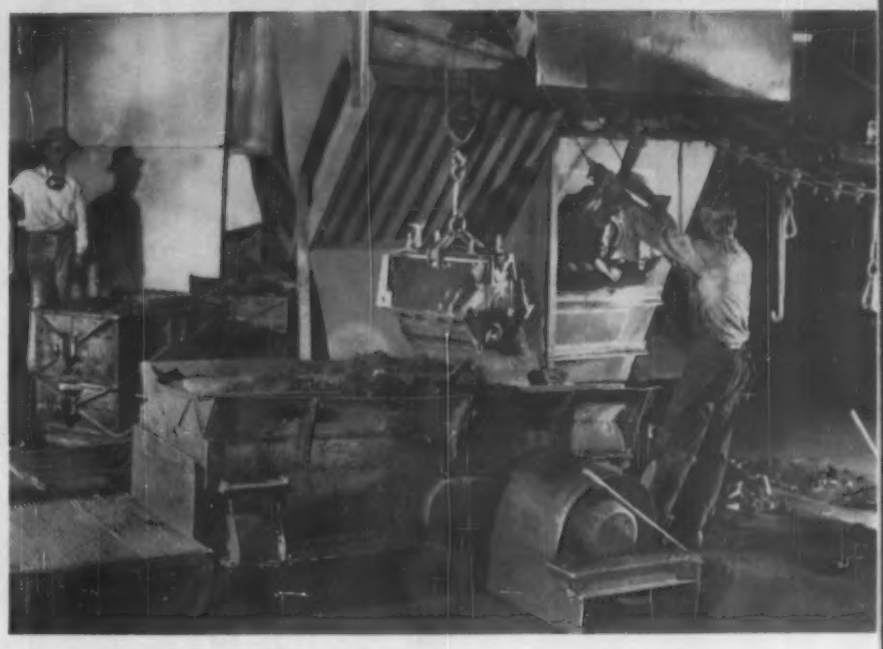
THE LAW STEPS IN

■ Legal decisions in at least two states have presented foundrymen, and proprietors of many other industries, with the danger of losing huge amounts of money through court-awarded damages to workers for loss of hearing.

One foundryman who has studied the problem recently reported that the awards which could result would make those for other workmen's compensation cases look like 10 cents.

Several hundred suits have been filed in New York State and it is hinted that if previous court decisions are upheld, the few hundred could turn into a "flood."

Further evidence of the potential seriousness of the problem arises from the fact that under the Federal Employees Compensation Act, which covers civil employees of the Federal Government, total loss of hearing in one ear may result in an award as large as $6,300, and in both ears $24,200. Awards for loss of hearing due to traumatic injury range from a high of $12,333 in Wisconsin to a low of $1,560 in Maine. Payments by industry on this account could total billions of dollars.



Inherent noisiness of many foundry operations creates a hearing hazard.

Before the advent of the workmen's compensation laws in the United States, the employee's legal remedy for an industrial injury was governed by common law. The employer had available the three common law defenses of (1) assumption of risk, (2) acts of a fellow servant, and (3) contributory negligence. Even if these hurdles were surmounted the worker had no assurance that damages would be collected from employers financially unable to make payment. As a result of this situation great hardship resulted to injured employees and their dependents.

To remedy these weaknesses, workmen's compensation acts were adopted. As originally conceived, compensation laws covered only accidental injuries but eventually the trend was toward amendment of the laws to include both accidents and occupational disease.

■ **The wage loss concept.** The original philosophy behind and purpose of the workmen's compensation laws has been to guarantee to the worker a portion of the wage loss caused by accidental injury or occupational disease. It has, therefore, been generally required that before the employee can establish a claim for compensation he must have suffered an actual wage loss or a loss of earning capacity.

■ **Factors in compensability of loss of hearing.** It appears likely that exposure to relatively low noise intensities may in time produce some decrease in hearing ability. However, severe cases of hearing impairment due to noise exposure are normally developed only by workers in extremely noisy occupations. In these occupations the noise which creates the hearing impairment is usually so intense that communication must be by means other than speech. Thus, the hearing impairment seldom occasions any lack of ability to continue in the normal occupation and seldom results in inability to continue to earn full wages. The same type of hearing loss which results from noise exposure may, however, occur as a result of other causes having no connection with the occupation.

Legislative Developments

Within recent years legislature action and court precedents in a few states have placed the loss of hearing problem in a different light from that described above for compensation cases.

■ **New York precedents.** In May, 1948, the New York State Court of Appeals ruling on the case of Slawinski v. J. H. Williams & Co. held that compensation was payable for hearing impairment under the schedule even though no loss of earnings was involved. Subsequently, the courts rendered a similar decision in the case of Rosatti v. Despatch Shops.

Since the above decisions, several hundred cases have been filed in New York but few awards have been made because of a ruling of the Workmen's Compensation Board that the worker must be absent from the injurious noise for at least six months before the extent of permanent hearing loss can

be determined. This ruling was based on medical opinion that some portion of the hearing loss will be recovered after removal from the noise but that until further research is completed the exact period of time necessary cannot be stated. The ruling is also supported as an expedient to forestall a flood of claims until solutions which are economically feasible and fair to both employers and employees can be devised.

▪ **Wisconsin precedents.** In Wisconsin a similar decision was made by the Supreme Court in the case of Wojcik v. Green Bay Drop Forge Co. To prevent a possible surge of claims, which it was recognized that industry was not in a position to handle, the state legislature passed a temporary law, effective July 1, 1953, requiring that in such cases the worker must have sustained an actual wage loss.

A new law was passed, effective July 1, 1955, which enables payments for loss of hearing under a schedule without a loss of earnings, but which requires the worker, among other conditions, to show the extent of permanent hearing loss after six months absence from the noisy environment. The effect of this provision is to delay the filing of claims until retirement or job severance for other reasons, thus enabling industry to build up some reserves for claims settlements.

Causative Factors In Loss of Hearing

Much of the difficulty of fixing the responsibility and determining remedies arises because noises which damage hearing are not restricted to industry and noise is not the only cause of the specific type of hearing loss to which industrial workers are subject.

Noises which have a harmful effect upon hearing are encountered off the job as well as on and people in general as well as industrial workers are exposed in some degree. The following list of typical exposures on and off the job demonstrates this point and indicates that full responsibility for all hearing losses, even though due to noise, cannot logically be assessed against industry.

Source	*Decibel Level*
Boiler factory	107
Inside four-engine airplane	100 and up
Punch presses	96-110
Subway train passing station	105
Loud radio or phonograph	90-100
Wood saw	100
Automobile	92
In a modern (quiet) streetcar	90
Noisy factory	90
Piano	80-100
Printing presses	80

Economic Impact

It becomes apparent that one of industry's major problems is to determine the degree of responsibility which should be assessed against it for an impairment which is not limited to industrial workers. Furthermore, since in the past industry has kept records neither of noise levels in the plants nor audiometric records of workers' hearing, it is impossible to determine during what periods of past employment hearing losses actually developed.

To estimate the probable cost of indiscriminate payment of claims for loss of hearing is an impossible task. Probably 10 per cent of the total population has hearing impairment. Based on recent records of pre-employment tests it seems obvious that the percentage among industrial workers is higher, probably about 25 per cent. The number of potential claimants could, therefore, run into millions.

It becomes obvious that if the compensation laws in various states were amended or interpreted to permit widespread payment for losses of hearing, regardless of cause, the total cost could run into billions of dollars.

The situation could be similar to that which existed in the state of New York some 20 years ago when silicosis suddenly became a similar problem. Because small businesses could not withstand the financial burden which was threatened and could not secure insurance to relieve them of the liability, many were threatened with bankruptcy and it has been estimated that from 35,000 to 50,000 workers became unemployed.

Solutions

▪ **Restoration of wage loss concept.** Because of the many factors involved, numerous industry groups feel that the only fair solution to the problem is to limit compensation to those cases in which there is a demonstrated loss of wages or of earning capacity.

▪ **Limitations on liability.** Partly as a means of keeping potential costs within bounds which industry can assume, various limitations on liability have been enacted or proposed. In Wisconsin, the maximum benefit payable for loss of hearing due to noise has been reduced to approximately one-half that payable for sudden loss of hearing due to traumatic injury.

▪ **Schedules with restrictive conditions.** In some states, measures either are in effect or have been proposed whereby payments for hearing loss are made under a schedule which limits the total number of weeks of compensation which may be paid. Wisconsin not only limits the amount of compensation but requires that the worker be removed from the noisy exposure for at least six months as a result of job severance, retirement, layoff or other cause.

▪ **Eventual basis of solution.** There can be no definite solutions to many of the problems presented above until much more has been learned through research. Since hearing losses due to noise develop over long years of exposure, it is necessary to make repeated hearing tests over long periods of time upon workers exposed to known types of noises.

It is essential that industry not only take steps to control noise as far as possible but also to maintain adequate medical records including pre-employment and periodic audiometric retests so that the origin of hearing losses may be established.

Once adequate medical and scientific data have been accumulated the eventual solution will lie in compromise.

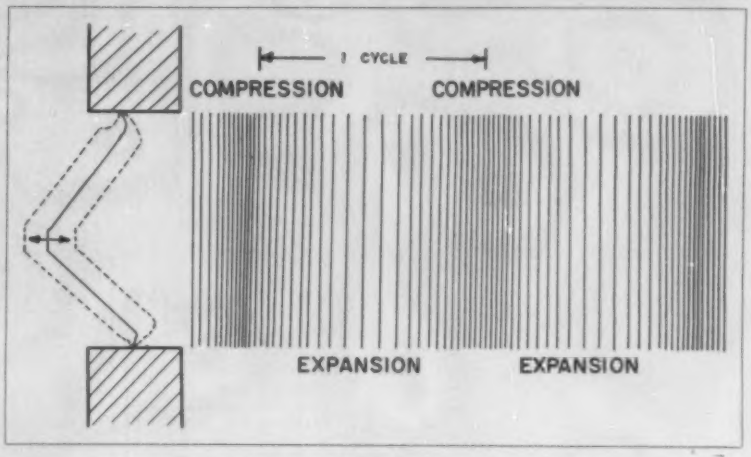


Fig. 1. Movement of diaphragm creates air vibrations which we call sound.

WHAT IS NOISE?

Let's define noise as "any sound that interferes with communication by means of speech."

■ **Noise may be defined** as "unwanted sound." This definition is not specific and will differ according to circumstances. A mechanic working on a diesel engine for several hours may regard the loud exhaust sound of the engine as pleasant. The passerby may consider it extremely objectionable. Thus noise is not so easily identified. We can say, however, that any sound that interferes with speech communication is "noise."

■ **Physics of Noise.** Noise is a specific kind of sound. Thus in order to study noise it is first necessary to study sound. Sound covers a range from the rustle of leaves to the blast of dynamite. It defines a particular phenomenon that occurs in any elastic material such as a gas or solid that can be compressed or expanded. The sound we generally encounter occurs in the atmosphere. Only the physics of atmospheric sound is considered here.

■ **Generation of sound.** Sound is generated when any surface in contact with the air vibrates. Consider a diaphragm moving back and forth as shown in Fig. 1. As the diaphragm moves out of the wall it compresses the air in front of it, thus raising the atmospheric pressure slightly. When the diaphragm moves into the wall it causes a slight vacuum, thus decreasing the atmospheric pressure slightly. Compression and expansion of the air (variations in atmospheric pressure) cause sound.

■ **Frequency of sound.** The number of variations in pressure generated per second is defined as the "frequency of the sound." One compression and one expansion constitutes a complete cycle. Thus, if the diaphragm in Fig. 1 moves out of the wall and back to its original position 1,000 times a second, it is said to be creating a sound whose frequency is 1,000 cycles per second. Young ears are sensitive to more of the frequencies than older ears. Some young ears can hear sound generated at frequencies of more than 20,000 cycles per second.

■ **The decibel** (Abbreviation: db). The decibel is a term associated with noise measurements. It represents a relative quantity and when used to express noise level a reference level is implied. In order to understand the meaning of the decibel, it is necessary to have a clear idea of the mathematical units used.

Sound waves create pressure and the human ear can detect sound pressure units ranging from 1 to one *trillion* (1 followed by 12 zeros). Such large numbers are clumsy to use. Imagine saying that a new street car causes a sound intensity of 1,000,000,000 (one thousand million) pressure units! By using a short form of mathematics (logarithms) the engineer says the street car causes a sound of 90 decibels.

To understand this, first let us consider some tricks the mathematicians use. Being lazy they always find short cuts and so they invented a numbers scheme called logarithms. Here's their trick.

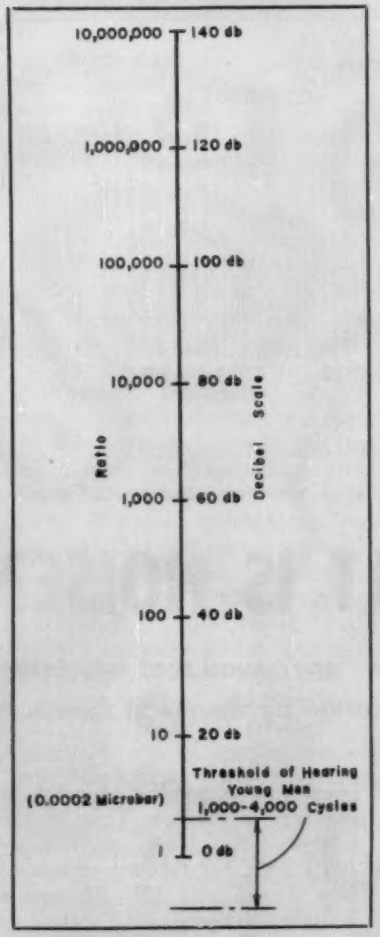
$10^1 = 10$
$10^2 = 100$
$10^3 = 1000$
$10^4 = 10000$
$10^5 = 100000$
$10^6 = 1000000$

Notice that the exponent of 10 is equal to the number of zeros in the second column. Thus if the mathematician wants to multiply 100 x 1000, he adds the exponents 2 + 3 and gets 10^5; 10^5 equals 100,000 (5 zeros).

Going back to the street car noise, we said it causes a sound intensity of 1,000,000,000 (9 zeros) pressure units. 1,000,000,000 is the same as 10^9; hence, the noise level of the street car is 9 bels. Since a decibel is 1/10 of a bel, the noise of the street car is 10 x 9 or 90 decibels.

The decibel is the ratio of a given sound pressure to a standard pressure. The standard pressure is arbitrarily taken as one pressure unit (the least sound the ear can hear). If a sound is 1,000 times greater than the standard pressure, its value in bels will be only 3 because 1,000 is the same as 10^3 and as we said before the mathematicians don't like large numbers and prefer to call a thousand only 3. Thus the decibel value will be 10 x 3 or 30.

Now suppose one machine makes a noise of 60 decibels (1,000,000 or 10^6 pressure units) and



Scale shows noise-decibel ratio.

TYPICAL NOISES AND THEIR DECIBEL RELATIONSHIPS

Typical noise levels	Decibels	If the difference between two sounds is:		Their ratio to each other is.
		0 bels	0 decibel	1 to 1
		1 "	10 "	1 to 10
Whisper @ 5 feet 20		2 "	20 "	1 to 100
		3 "	30 "	1 to 1000
		4 "	40 "	1 to 10,000
Average conversation 40-60		5 "	50 "	1 to 100,000
Household vent fan	56			
		6 "	60 "	1 to 1,000,000
Automobile 50 ft away	68			
		7 "	70 "	1 to 10,000,000
Quiet factory	76			
		8 "	80 "	1 to 100,000,000
Annealing furnace	84			
		9 "	90 "	1 to 1,000,000,000
Pneumatic ramming	91			
Shakeout	98			
New York subway	100	10 "	100 "	1 to 10,000,000,000
Power house	116			

an adjacent machine makes a noise of 1,000,000 units. Obviously, the noise intensity is now 2,000,000 pressure units. We have doubled the noise intensity but the increase in decibels is only three—not 120—because the logarithm of 1,000,000 is 6 and of 2,000,000 6.3, and $6.3 \times 10 = 63$ decibels. Conversely, if we cut a noise in half we have reduced it by only three decibels. Thus a three-decibel reduction in noise is quite large. We can also say that a decrease of one decibel is equivalent to a 26 per cent decrease in sound intensity.

A very noisy factory may have a sound level of 100 decibels. This is equal to 10,000,000,000 pressure units (10^{10}). A typical office may have a sound level of 60 decibels which is equal to 1,000,000 pressure units (10^6). Notice that the noise intensity in the factory is 10,000 times greater than in the office, yet the increase in decibels is only 40.

For every increase of 10 decibels, a sound becomes ten times as loud, as shown in the accompanying table.

Notice how the number of zeros in the third column is equal to the number of bels in the first column. Multiplying the first column by 10 yields the number of decibels in the second column at top of page.

■ **The Sone.** A convenient unit of loudness called the *sone* has been devised which evaluates loudness on an arithmetical basis. The sone scale is so arranged that a noise which sounds twice as loud as another has a loudness of two sones. This loudness unit, the sone, may be referred to as a sensation unit

Experimental subjects were asked to judge the loudness ratio of sounds; that is to state when one sound is twice, four times, eight times, etc., as loud as another. On the basis of such judgments the loudness scale was devised to rate sounds from "soft" to "loud" in units of sones.

By referring to Fig. 2 it will be seen that the difference, for example, between the loudness of a nail-making machine and that of a sand blast unit is 800 sones but only four decibels.

Thus the sensation unit, the sone, expresses in a simple way the loudness of the noise reaching the ear.

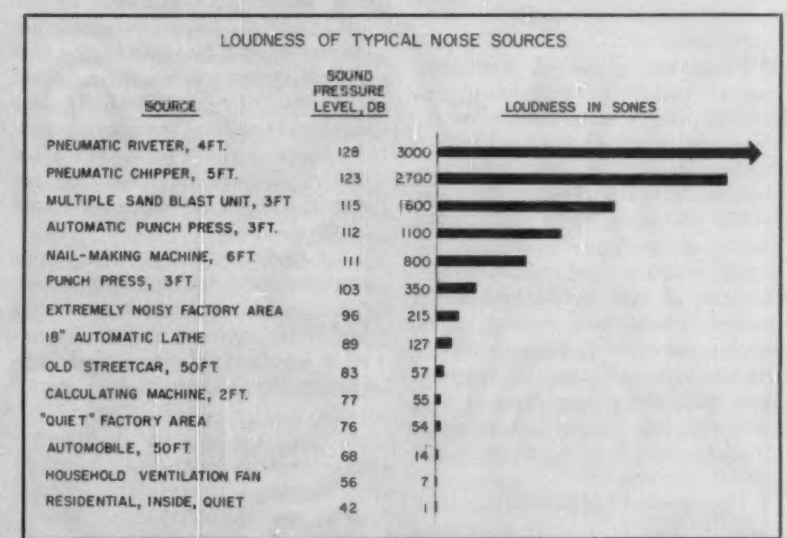

LOUDNESS OF TYPICAL NOISE SOURCES
SOURCE
SOUND PRESSURE LEVEL, DB
LOUDNESS IN SONES
PNEUMATIC RIVETER, 4FT. 128 3000
PNEUMATIC CHIPPER, 5FT. 123 2700
MULTIPLE SAND BLAST UNIT, 3FT 115 1600
AUTOMATIC PUNCH PRESS, 3FT. 112 1100
NAIL-MAKING MACHINE, 6FT 111 800
PUNCH PRESS, 3FT 103 350
EXTREMELY NOISY FACTORY AREA 96 215
18" AUTOMATIC LATHE 89 127
OLD STREETCAR, 50FT 83 57
CALCULATING MACHINE, 2FT. 77 55
"QUIET" FACTORY AREA 76 54
AUTOMOBILE, 50FT 68 14
HOUSEHOLD VENTILATION FAN 56 7
RESIDENTIAL, INSIDE, QUIET 42 1

Fig. 2. Sone scale evaluates loundness as an ear would hear the sound.

Pneumatic chipper is one of many foundry machines with high db ratings.

SOURCES OF NOISE

Foundry workers are subject to all kinds of noises and some are above the damage risk criterion

■ **Foundry workers** are in contact with various types of noise sources which may affect a worker singly or in combinations, depending on his job. The sources of noise can be classified in two general ways: (a) by frequency of the noise source; (b) by the type of agent causing noise.

BY NOISE SOURCE FREQUENCY

■ **Steady noise exposure.** The employee is exposed over a long period of time to noise which does not change greatly either in sound level or frequency. A working environment near floor furnaces or blowers which are continuously functioning is an example.

■ **Intermittent noise exposures-irregular.** This type of exposure results from the sound of a sharp blow such as in some degating operations or the sound of castings being dropped in a tote box. The frequency of the impact or dropping would vary as would the level produced due to factors such as size, shape and distance of drop.

■ **Intermittent noise exposures-regular.** A chipper or pneumatic tamper would cause an exposure of this type. The repetition of the noise would be regular from a time cycle standpoint but again according to sizes, shapes, etc., the frequency and levels of noise would vary.

BY TYPE OF AGENT CAUSING NOISE

■ **Impact noises.** In these cases the noise is produced by the impact of one object upon another. In a typical foundry degating operations, knockouts and shakeouts would be examples of this group.

■ **Friction noises.** These noise sources result from friction between two objects. In foundries such noises would exist near any belt-driven motors, around exhaust fan bearings and in machining or woodworking areas.

■ **Compressed gas noises.** The use of compressed air for blowing off molds, in activating hoists, or in sounding whistles is an example of this type of noise source. Some noises are continuous, others intermittent.

■ **Rapid reciprocating noises.** This group of noise sources would include noise generated by the imbalance of a high-speed shaft or the motion of an unbalanced crankshaft. Such noises could exist around motors, blowers and the like.

HEARING DAMAGE CRITERION

■ In order to evaluate correctly noise exposures in a foundry, some attempt should be made to establish a criterion above which exposure might be harmful and below which negligible effects can be expected. Admittedly age, individual susceptibility and previous work histories, along with family history are factors to be considered.

Following is a suggested criterion which should apply to the *average* worker when a steady noise is present in the environment. Many criteria have been proposed by different authorities. Examination of these criteria shows some disagreement because of lack of sufficient data. A completely satisfactory criterion has not been established.

DAMAGE RISK CRITERION*

Octave band frequencies in cycles per second	Octave band levels of continuous noise in decibels
25-75	110
75-150	102
150-300	97
300-600	95
600-1200	95
1200-2400	95
2400-4800	95
4800-9600	95

* Tentative criterion for negligible risk of damage to hearing. Levels in decibels not to be exceeded for reasonable assurance of no permanent damage. Unit: Decibels re 0.0002 microbar.

This table is valid for long periods (years) of exposure. The numbers are approximate. Exposure levels of 10 decibels lower would involve negligible risks, while those of 10 decibels higher would result in significant hearing loss. The levels apply to noise that has a reasonably continuous character with no substantial sharp energy peaks.

Where frequency analysis in octave bands is not available, in general the probability of damage within a short time is high for noises at levels of 120 to 130 decibels or more and ultimately for levels of 100 to 120 decibels. Certain noises at levels of 90 to 100 decibels may produce damage in highly susceptible individuals.

In order to obtain minimum exposures involving steady noise it would appear that the following might provide a satisfactory *design* base-line:

Frequency in CPS	Level db Re 0.0002 microbars
75-150	95
150-300	93
300-600	90
600-1200	90
1200-2400	90
2400-4800	90

INTERMITTENT REGULAR AND IRREGULAR NOISES

■ For these types of noise sources, there are not sufficient data available to establish any criteria for environmental levels.

TYPICAL NOISE SOURCES

■ A considerable number of noise surveys have been made in typical foundries. One of the more complete reports, by Karplus and Bonvallet, was published in the December, 1953, *American Industrial Hygiene Association Quarterly*. Octave band analyses were listed for specific machines. These typical data are in Table I.

TABLE I . . MACHINERY NOISE

Type of Machine	Octave band levels—decibels										
	Overall level	37.5-75	75-150	150-300	300-600	600-1200	1200-2400	2400-4800	4800-10KC	Total loudness sones	Loudest band sones
Shakeout, 50 sq ft ½-1 cu ft castings	114	110	109	102	105	106	99	97	90	790	160
Pneumatic ram, 100 psi, sand mold ramming	90	83	81	83	85	84	83	73	..	140	33
Shakeout, 40 sq ft ½-1 cu ft castings	105	89	86	94	93	101	99	95	88	540	160
Tumbler, 36" x 72", small castings	100	78	78	86	91	95	95	92	92	390	105
Pneumatic chipper, 100 psi, 1-3 cu ft castings	110	88	90	95	96	97	106	104	106	1100	470
Push up machine, 14" x 4" sand molding	103	94	96	91	92	97	94	87	85	380	80
Core blower, Making sand cores	116	86	84	86	87	108	101	110	114	1600	800
Core draw vib., bench cores	107	85	81	81	90	98	103	102	98	770	330
Shakeout, 10" x 10", 2-4 cu ft castings	98	90	91	89	87	94	91	90	88	340	90
Pneu. chipper, 100 psi, 4'-6' castings	112	82	84	83	90	109	109	100	96	840	340
Air hoist, 2000 lb, pneu.	112	92	84	88	87	93	93	96	110	620	230
Stand grinder, 36", small castings	96	88	87	88	86	92	83	81	81	180	50
Electric furnace 30 ton, early in run	105	95	100	98	97	94	91	90	86	410	90
Sand slinger, air rush & sand noise	102	90	96	94	94	94	91	87	88	350	69
Jolt squeeze mach. 13" sand molding	100	87	90	87	91	96	91	92	84	350	110
Shakeout, 8' x 5' x 3' deep, 1 cu ft castings	108	91	92	97	99	102	103	100	96	800	280
Pre-mix burner, 2" outlet, gas, crucible heat	94	91	89	87	77	78	78	76	77	140	24
Scarfing, acetylene weld, equip.	91	78	74	67	73	84	83	84	86	140	45

In another study of three large foundries, a series of 567 octave band analyses were made. When these data were coded, it was found that 219 of these analyses were above the damage risk criterion listed previously. These high analyses are shown in Table II.

When these results are studied further it is apparent that the use of compressed air contributes to a good percentage of the high noise. In addition, mechanical vibrating equipment and tumblers account for another large percentage of the high noise sources. These two sources of noise should be studied first in order to determine where noise control will be most effective.

TABLE II . . HIGH NOISE LEVEL SOURCES IN THREE LARGE PRODUCTION FOUNDRIES

Noise source	Number analyses above damage risk criterion
Shakeouts with mechanical vibration	40
*Core machines—air operated	31
Grinding and chipping	27
*Air blow-offs	22
Knockouts with mechanical vibration	15
*Flask vibrators—air operated	12
Flask vibrators—mechanical	11
*Molding machines—air operated	8
*Air hoists	6
Tumblers	4
*Whistles, horns, sirens	4
Miscellaneous sources	39
	219 high values in 567 areas

* Air used intermittently.

The First Step— NOISE MEASUREMENT

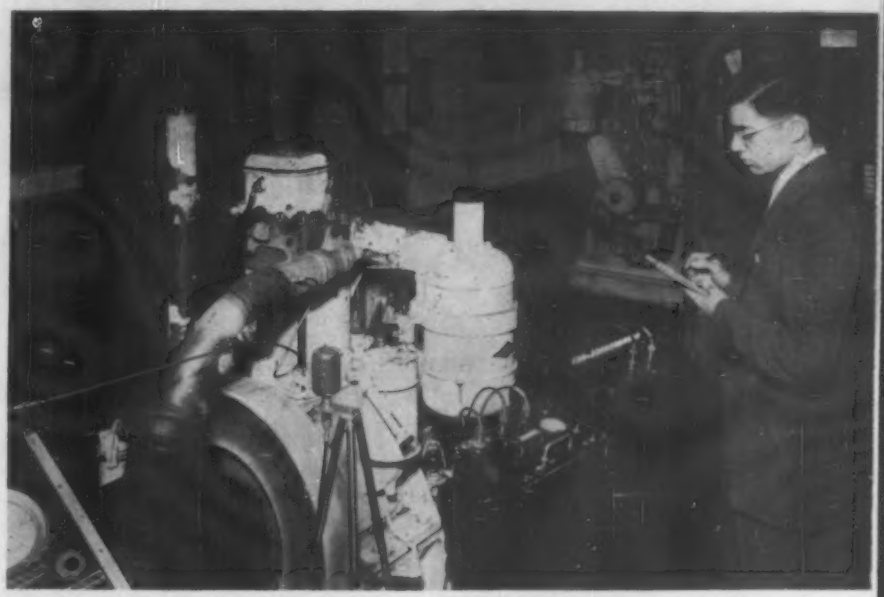


Fig. 1 . . Octave band analyzer measures industrial noise in octave bands.

Sound Level Meters

■ The basic instrument for measuring noise is the sound level meter but it should nearly always be used in conjunction with analyzing equipment. Essentially, the sound level meter consists of a microphone, amplifier and an indicating meter.

Although the response of the sound level meter can be made somewhat like that of the ear by the use of one of three electronic filters known as weighting networks, its indications do not correlate well with the ear's estimation of loudness.

The microphone is one of the less satisfactory elements of the sound level meter. Several different types of microphones have been used in sound meters but the Rochelle Salt crystal and the dynamic type microphones are more common. These are suitable for ordinary work but their limitations should not be overlooked. For instance, for accurate measurement the Rochelle Salt crystal microphone must not be operated in temperatures around 100° F without suitable correction.

The range of sound levels for which the sound meter can be used is from about 25 db to 130 db for some instruments, and to 140 db for others. Measurements at the extreme ends of this range may not be accurate because of circuit noise at the low sound levels and difficulties due to microphonics or instrument component vibration at high levels.

Frequency Analysis Equipment

Industrial noise consists of sound energy of many frequencies and it is desirable to analyze all these. Far more can be learned about a noise by analyzing it with respect to frequency. Noise levels determined at various frequencies are much more satisfactory than a single overall level.

In general, three types of equipment can be used to analyze noise: (1) the octave band analyzer which is the most important type; (2) the constant-percentage narrow band type; (3) the constant bandwidth, narrow-band analyzer which is probably of least importance. Only the octave band analyzer is described here.

■ **The octave band analyzer.** The purpose of the octave band analyzer is to measure industrial noise in octave bands. It is especially applicable to measurement of industrial exposure to noise.

The loudness in sones is also advantageous because the resulting single number facilitates comparison of different kinds of noise. Such a figure is understandable and satisfactory to non-technical personnel. The loudness for most machines correlates better with ear judgments of the noise than does the overall sound level.

Equipment now in use provides for measurement in the following most-used octave bands: below 75 cps, (cycles per second) 75-150 cps, 150-300 cps, etc., up to 2400-4800 cps and 4800 to 9600 or 10,000 cps. Octave band instruments therefore require measurements in only eight bands, and the time for analysis is reasonable for field work. Fig. 1 shows typical octave band analyzer in use.

Use of Equipment

Manufacturers give adequate information for use of their equipment in the field but some precautions regarding operation should be taken.

The sound level meter and analyzer should be placed on a suitable table arranged so that the microphone will be in a proper position as described later.

Most current sound level meters and analyzers are provided with both fast and slow meter-needle movements.

Few industrial noises are steady. Therefore, the indications of the fast needle movement often are such that the needle may have minimum and maximum readings which differ by one or more decibels. If the slow movement does not average these satisfactorily due

to slow cyclical noise changes, then a mental averaging is necessary. If the indicated range is from 90 to 96 db, for example, the arithmetic average of 93 ± 3 db should be logged.

The floor of an area in which sound level readings are to be made may vibrate excessively so that the sound measuring equipment placed on a table or a cart may give false readings. Such indications can be identified by lifting the measuring equipment with the hands, resulting in lower readings. This should be done in all octave bands if such difficulties are suspected. The trouble may be greatly reduced by placing the instruments on soft sponge rubber pads an inch or more thick.

Special Measurement Techniques

In general, sound measurement equipment is not difficult to use and the instructions provided are satisfactory. However, a number of factors require special attention.

▪ **Microphone techniques.** The position of the microphone is important. Proper placement depends on the type of information desired.

1. Microphone placement for noise exposure measurements. When noise measurements are being made to determine levels of noise to which an employee is exposed, the microphone should be placed in a region about which he moves. Most industrial noises are in enclosed spaces. The workman often is about four or five feet from the source and he usually moves around so that his distance to the source is changing constantly. Under these conditions the sound pressure level will be substantially the same for a relatively large area. Accurate distance measurements therefore are not necessary but a distance of about three to five feet from the ear is suitable. If the workman is closer than several feet from the noise source for long periods of time the microphone should be somewhat closer to the ear and more nearly the same distance from the source as the ear.

Under these conditions the noise measured may not be from the particular machine attended by the workman but it is representative of his exposure to noise.

2. Microphone placement for noise control measurements. Many measurements made for noise control purposes require that the microphone be placed to measure reverberant levels (levels which include reflected sound from walls, etc.) rather than direct levels which are obtained relatively close to machinery.

If it is desired to measure general noise conditions including reverberation or reflection effects, in most rooms the microphone distance from the source should be relatively large, say 10 to 20 feet. If only the direct sound is to be measured, a distance such as one to five feet from the source may be more suitable.

3. Microphone techniques for special conditions. The microphone should not be placed in strong air currents such as exist in ventilation ducts or outlets, since readings taken under such conditions are due to air motion effects on the microphone element and are false indications.

When equipment is mounted on a compliant wood floor or wall, the floor or wall is likely to emit a considerable portion of the total noise. Since the total noise is usually of interest, measurements of total noise may be made as described previously. If the noise of the machine alone is wanted for such purposes as control of noise, the noise measuring equipment should be isolated from the floor or wall with vibration mountings so that no floor or wall noise radiation results.

▪ **Standing waves and reflections.** When the noise being measured consists of one or more pitched tones and when adjacent walls and a ceiling surround the source, it is a rather common experience to hear the variation in intensity due to standing-wave or pattern effects upon slight movement of the head. This is also true with some complex noises when the radiating area or some reflecting surface on or near the machine focuses the noise energy. Measurements under such conditions must be compensated by an averaging technique or treated in some way to recognize peak and minimum values.

▪ **Effect of background noise.** In most industries the sound measured near a single machine is the noise of that machine combined with the background noise. For most purposes it is desirable to measure the total noise since it is this condition to which personnel are exposed. Under these conditions the measurements are as read.

For some noise control purposes, however, the noise measurement of a single machine operating in a noisy background often is desired. In these cases, measurements generally are made relatively close to the machine and its noise must be separated from the background by means of a correction.

Generally, if the noise at a machine being measured is 10 db above the background (in octave bands) when the machine is off, then the background level can be disregarded. If there is no increase in the indicated level when the machine being investigated is turned on, then its level is below the background and cannot be measured under the existing condition.

If the octave level is increased when the machine is on, but is less than 10 db above the background, then a correction can be applied to the indicated level of background and machine noise. The following table shows the required correction:

Difference between octave levels of background and machine, and background alone, db	Db to be subtracted from octave levels of background and machine noise
1	7
2	4.3
3	3
4	2.2
5	1.7
6	1.3
8	0.8
10	0.4
over 10	0

As an example, if the combination of background and machine noise has a level of 84 db in an octave band and the level for the background alone is 80 db, then the correction of 2.2 db (corresponding to the 4 db difference) must be subtracted from the 84 db, resulting in a level of 81.8.

For practical purposes the machine noise alone can be considered as 82 db.

CALCULATING BROAD-BAND NOISE

■ In most cases of industrial noise measurement, octave band data yield sufficient information about the noise. From these data one can describe with fair accuracy the effect of noise on speech, the loudness of the noise, and probably when sufficient data are available the extent of its damage to hearing. In many problems where control and reduction of noise are involved it is advantageous to represent the noise by a single number. In such cases, the loudness of the noise is an important characteristic.

The method of calculating the loudness of broad-band noise is important in studying industrial noise exposures.

Curves shown in Fig. 2 facilitate the computation. The vertical scale at the left is the loudness in sones. This unit was described previously. The vertical scale at the right is the loudness level in phons. The determination of loudness in phons has been employed as a loudness indication but is no longer in general use. The relation between sones and phons can be seen from the figure.

At equally spaced intervals along the abscissa are shown octave bands covering the audible spectrum and used in currently available octave analyzers. The curves shown correspond to equal sound pressure levels in octave bands. Thus a level of 70 db in the 150-300 cps band corresponds to a loudness of 6 sones, one of 70 db in the 600-1200 cps band has a loudness of 10 sones, and a level of 70 db in the 2400-4800 cps band has a loudness of 15 sones. It can be seen that the loudness in the 2400-4800 cps band is very high compared to loudness at equal sound pressure levels at lower or higher frequencies. Intense noise in low frequency bands (which usually produce high overall levels) has a low loudness value. This chart is useful in showing those frequencies which are important to loudness as judged by the ear.

The loudness in sones for each band is read from the scale at the left. These individual octave band loudnesses are added arithmetically, the sum being the total loudness. The convenience of being able to add octave band loudnesses to obtain the total loudness by means of such a chart can easily be seen.

The two curves (Pneumatic peen hammer and anneal furnace noise) shown in Fig. 2 illustrate the loudness calculation. The two analyses presented in the figure were chosen to emphasize the value of the loudness figures over the overall levels. It can be seen that the loudnesses of 425 and 211 for these two sources are in the ratio of two to one. These loudness values confirm the ear evaluation that one is about twice as loud as the other. When it is realized that both noises had overall levels of 102 db, the value of the loudness figure becomes more apparent.

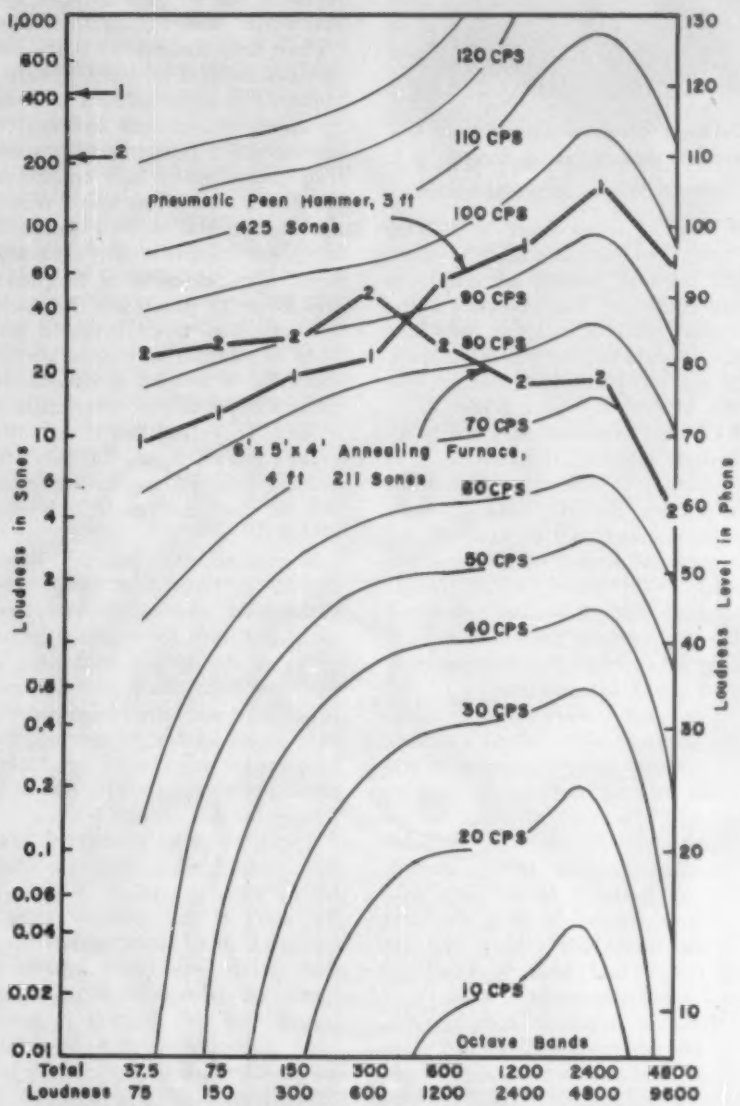


Fig. 2 . . Curves correspond to equal sound pressure levels in octave bands. The loudness values compare with ear evaluations rather than decibel levels.

NOW HEAR THIS

Earmuff protector works but it doesn't replace noise control.

■ **Medical supervision** of workers exposed to excessive noise is essential for the benefit of employee and employer. The objective is the conservation of hearing, which is accomplished by examination, proper job placement, and protection against excessive noise.

■ **Clinical examination.** Prior to industrial medical examination, it is customary to obtain a detailed history from the applicant covering prior occupational experience and a personal record of illnesses and injuries. In many cases, family medical history is also requested. Most physicians feel that a carefully taken history is indispensable to a good examination.

For noisy work environments, the history taking should include particularly noise exposures in previous jobs as well as in military service. The medical phase of the inquiry should embrace earache, ear discharge, ear injury, surgery (ear or mastoid), head injury with unconsciousness, ringing, deafness in the immediate family, the use of drugs, and history of allergy and toxic exposures.

Routine medical examinations, in this circumstance, require more than usual attention to such conditions as malformation of the external ear or canal, obstruction or drainage, perforation or scarring of the ear drum, and diseases of the nose or throat.

Permanent records should be made of each examination.

■ **Audiometric examination.** Objective examination of the auditory apparatus is supplemented by subjective tests of hearing acuity. These are made by use of an audiometer, a modern scientific testing instrument. Audiometric tests have replaced others such as the "spoken voice" and tuning fork tests.

Pure tone audiometry is the recognized method of testing hearing ability. The audiometer is powered by an electric current and enables production of pure tones in various frequencies which are audible to the human ear. Controlled sounds are sent to the ears by means of ear phones under controlled conditions. Control of both frequency and intensity (pitch and loudness) of these pure tones makes it possible to measure with accuracy the threshold of hearing at various frequencies and to plot the results on a chart. This chart, called an audiogram, indicates in decibels the hearing loss (a zero reading meaning no loss) for each frequency tested.

In general, the "normal" young human ear can hear frequencies between 20 and 20,000 cycles per second. Acuity for the higher frequencies diminishes with age, so that few individuals over 50 years of age hear sounds with frequencies over 12,000 cycles per second. The frequencies important for speech intelligibility range from 500 to 2,000 cycles per second (cps).

The best measurement of hearing is obtained if tests are made before noise exposure, such as at the start of the shift or after a weekend away from work. This is due to the condition known as "temporary threshold shift," which means that the hearing is poorer after exposure to excessive noise and better after a period of absence from noise exposure.

The room in which audiometric testing is conducted must be as free from noise as possible. Tests made in the presence of extraneous sound are inaccurate because of the masking effect of the ambient noise on the ear. Studies have shown that there is little or no masking effect if ambient noise in the test room is kept below 50 decibels. Standards for test rooms are available. In addition, at least two concerns manufacture audiometric testing rooms which meet the necessary requirements if properly installed.

In many industrial situations it will be difficult to find a suitable room ready made and it may be necessary to construct a special room for this purpose. Prefabricated "quiet" rooms are also available commercially.

A permanent record (audiogram) should be made of each audiometric test, properly identified as to name of subject, date, time, and name of person giving test, and it should be kept with other medical records.

Audiograms which show a hearing loss in excess of 20 decibels in two or more of the frequencies from 500 to 6000 indicate significant hearing loss. Losses of less than 10 decibels are considered to be within normal limits. Diagnosis and determination of the cause of hearing loss is solely a medical function and frequently requires the assistance of a consulting otologist.

■ **Frequency of examination.** Examination of workers in excessive noise should be made prior to employment in order to determine and record the hearing status and presence of related disorders of the ears, nose, or throat.

Transfer of a worker from a non-noisy job to one that is potentially harmful to hearing should be preceded by examination conducted in the same detail as a pre-employment examination.

Periodic examinations of workers are equally important after placement in a noisy environment. These

periodic tests may be confined largely to audiometric tests for detection of early evidence of hearing damage due to previously unsuspected sensitivity. Re-examinations should be made about 30 days after placement to test for possible early effects of noise and at semi-annual or yearly intervals thereafter, depending on the noise levels to which the worker is exposed.

▪ **Job placement.** Proper job placement of workers, matching their physical capacities to the physical demands and exposures of jobs, is an established function of the industrial physician. Exposure of workers to excessive noise involves application of the same principles. The applicant with a detected hyper-sensitivity to noise should not be so exposed, whereas the otherwise qualified totally deaf individual would be ideal because of the absence of any possibility of further damage to his hearing.

The individual with an incomplete hearing loss due to exposure to excessive noise should be protected against further loss by proper job assignment, by the use of adequate engineering controls, or the use of personal protective devices.

If the cause of hearing loss is non-occupational, the worker should be urged to see his personal physician for prompt medical care, if needed. If the occupation is determined to be a causative factor, further efforts at engineering control of the noise should be instituted or better personal ear protection provided. Occasionally, transfer of sensitive individuals to less noisy work may be necessary.

▪ **Protective devices.** The ideal method of preventing noise damage to the ear is by control or reduction of the noise at its source by engineering methods. When these controls are not feasible or are only partially successful, it may be necessary to resort to protection of the workers through the use of suitable ear plugs, earmuffs or helmets.

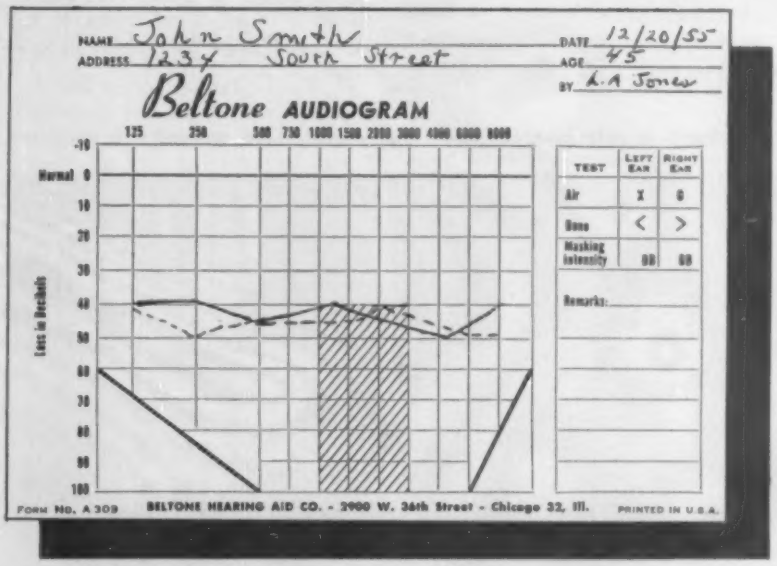
Personal protective devices designed to reduce the amount of noise reaching the auditory nerve of the worker also call for medical supervision. This is especially true of those devices which must be placed in the auditory canal. Sanitation and hygiene require that such devices be personal. Fitting and usage may produce bad results in the absence of medical direction. In addition to advising on the hygienic problems involved, the physician may also aid in the educational program necessary.

Although ear protectors should never be regarded as substitutes for noise elimination at the source or other engineering control measures, they do provide a practical means of protecting workmen where noise control is difficult or in situations where, even after control measures have been applied, the noise level is still too high. It is necessary in such instances that the operators be protected with properly designed and fitted ear protectors (ear plugs) which will reduce the intensity of the sound reaching the hearing mechanism. This is as necessary for protection of ears as is the use of safety goggles for the protection of the eyes.

There are three general methods of protecting the ear in this manner: (1) substances inserted into the canal (insert types); (2) objects covering the orifice of the canal usually including the auricle (muff-types), and (3) fitted coverings which include the major area of the skull (helmet-types).

Insert-type protector should be fitted only by a physician.

The amount of sound protection offered by good ear protectors varies somewhat with design but is in the approximate range of 25 to 30 decibels. Under conditions of extreme noise a combination of both the ear plug and muff-type may be worn, which gives superior protection to either device when used alone. To date little application of the helmet-type has been made in industry.



Audiogram plots hearing ability at all frequencies, is an invaluable aid.

Sparks fly but no sound is heard after grinding machines get "treatment."

NOISE CONTROL for $2,611.22

By E. R. Lund, foundry superintendent, and Wm. O. Hanson, director of safety & hygiene, both of the Allis Chalmers Mfg. Co., LaCrosse Works. Condensed from "You Can Reduce Noise in Your Foundry," a paper to be presented at the 1956 Castings Congress and Show in May.

■ Whenever you must take a man by the arm and conduct him to another section of the shop so that you can hold a conversation with him, you know a noise problem exists and you're turning your back to it if you don't acknowledge it. We had this situation in our foundry cleaning room.

Foundrymen know what equipment or combination of equipment is the source of noise. They do not need a sound level meter to tell them that noise is excessive in these areas.

Sand in tote box cut noise. Skip and box were sprayed with deadener.

I will explain here three concrete steps in the problem of noise abatement gained from the experience in our shop.

1. Noise reduction and control by isolation. We will confine noises to its source.

2. Noise control by changing the directivity pattern of the noise. We will direct the noise away from hearing zones of men working near a noise source.

3. Noise control by absorption of the noise. We will absorb noise after it is directed to areas that will permit installation of sound absorbing materials.

Let me illustrate these three steps by giving you a history of our experiences.

Tests conducted on November 25, 1953, showed noise levels of 93 to 110 db. At this time an analysis of the noise made with an octave band analyzer indicated noise levels in the 600 to 2,400 cycles per second range to be constantly above 92 db almost anywhere in the cleaning room, with exposure in the hearing zone of the greater number of employees averaging 96 db in these frequencies.

Two tumbling barrel operators and two men who serviced airless blast tumblers were subject to exposures running to 102 db in the high frequencies. These exposures were noted to be present for about five of the eight hours of the working day. Overall noise levels during these tests ranged from 94 to 106 db with intermittent noises of 112 db.

The cleaning room is 40 x 70 ft with the roof coming to a peak 30 ft over the center of the building. The walls are brick and tile. A cement floor covers most of the area with some brick and wood blocks in the center. The ceiling is asbestos tile, block type, with one skylight about the width of the room located in the center of the roof. One doorway leading into the main foundry room is located about the center of the room and is 12 ft wide. Girders and supports, all of steel, form a network overhead beginning about 12 ft above the floor. Windows cover an area on east and west sides of 8 x 40

ft beginning at a height of 4 ft from the floor. One double door leading to the outside is located at the southeast corner of the room with a single door to the outside on the northeast corner.

Sixteen to 20 men are usually engaged in tumbling, grinding, cleaning castings, and trucking. Two small air grinders and chipping tools are used intermittently and some swing grinding is done occasionally.

There are four tumbling barrels of which two are usually in use for the first three hours in the morning. Occasionally three barrels are running at the same time and sometimes the fourth barrel is used. The greater majority of time two barrels are used. One airless blast tumbler is used steadily all morning and intermittently during the afternoon. Occasionally we use both airless blast tumblers simultaneously. Grinding by at least five to eight men is a steady morning's job.

In the room are four double grinders using 20 in. diameter wheels, also one swing grinder which is used intermittently and a second airless blast tumbler that is not in use regularly. The throwing of castings into trays and blast machines is a regular source of noise.

Studies of noise sources and noise transmission paths were made over a period of several months. During this time all noise exposures in the foundry cleaning room were thoroughly investigated.

Four tumbling barrels were the main noise source. When studies indicated noise being transmitted through a re-enforced cement apron on which the barrels stood and coming out at an airless blast tumbler located across the room on the same apron, isolation of these barrels by footing changes was indicated. Several types of isolators, mounts, and various types of shock absorbing materials were investigated. The best results were obtained with a commercially manufactured material thoroughly impregnated with a special rubber or neoprene compound.

In isolating the footing of the tumbling barrels we used grommets and washers on the nuts and bolts as well as 5/8 in. thick pads to insure complete isolation. A significant reduction in the general noise level with the elimination of transmission problems was thereby achieved.

Another serious noise level was created when employees tossed castings into two airless blast tumbler hoppers. While this noise was intermittent, the frequency and loudness were sufficient to cause a serious problem. Levels exceeding 112 db when castings were hitting the bottom of the hopper, and seldom falling below 100 db when the hopper was filling, were constantly recorded.

The high frequency of the noise, along with its intensity, caused employees to complain of this operation more than any other in the cleaning room. Because of our abatement measures serious complaints no longer exist. Reductions in loudness across the frequency band averaged slightly more than 19 db, with best results in the higher frequency bands.

Cost of the dampeners installed in the hoppers was very low, amounting to about $150 each. Their simplicity of construction and effectiveness have been a constant source of favorable comment by those who have observed their use. After some six months of hard use there is no indication that maintenance will be a problem.

Throwing castings into steel trays was another source of annoyance. To help in reducing this noise source a series of tests was made using a commercially available rubber base sheet metal deadener which was applied to outer sides and bottoms of the trays. First a 1/8 in. coating similar to that applied to automobiles was used. While it was an improvement, 1/4 in. applied in two coats was found to be much more effective, with 48 hours drying time between coats. Considerable improvement both in reduction of loudness and frequency resulted.

Test trays to which the deadener was applied by an outside body shop would cost about $3 per tray. By purchasing spraying equipment and buying the material direct, the cost was cut to slightly over $1 per tray. In addition, we covered with two inches of sand the bottoms of all trays into which castings are dropped from hoppers. The 2 in. of sand covers the corrugations on the bottom of the tray about 1 in., giving a 2 in. layer of sand in one-half of the tray and a 1 in. layer in the remainder.

Treatment of the outside of tumbling barrels with a 1/4 in. coating of the same rubber base deadener as used on trays also resulted in a small but noticeable improvement. The airless blast tumbler hoppers were also treated. Finally, all sheet metal guards were removed, sprayed with deadener and replaced, using additional means of stiffening where vibration was indicated. All these steps, while small, actually reduced the overall level in the room about 2 db.

A further step was taken with the intention of directing the transmission path of noise from the tumbling barrels away from the hearing zones of persons working in the area. Costs were obtained from commercial sources for the installation of sound barriers in front or around the barrels. Prices quoted began at $5 a sq ft and went up to $12 sq ft. We felt the cost was too high.

Using a plain wood barrier with wings tilted inward toward the

Pad installed under tool rest also helped reduce the noise.

barrel about 30°, we found a substantial reduction in noise level was accomplished, more noticeably in front of the machines. Checks throughout the room indicated the air-transmitted path of the noise had been directed upward and some energy was dissipated in the ceiling area. The noise reduction in lesser degrees was reflected throughout the room. This installation was made by using low cost No. 3 spruce boards 3/4 in. thick, 8 in. wide and attaching them to guards that were already present in front of each tumbling barrel. We also found that spraying a 1/8 in. coating of rubber base deadener on the inside of the barrier added to its effectiveness. The results showed an average reduction throughout the room of 3.7 db with 4 and 5 db reductions directly in front of the barrels.

Following the installation of the barriers in front of the tumbling barrels we found we still had a noise level ranging from 90 to 98 db overall in the room. The installation of overhead sound absorbers was considered the next step.

A search for absorbant materials revealed that comprehensive data were available for seven or eight makes and types. All these manufacturers provided a method of computing absorption needs, most of them based on Sabine's formula. Knowing the prevailing frequencies we were most interested in reducing, data furnished by these people were not difficult to correlate with our problem.

Tests were conducted on all available types of acoustic absorbents to help us decide which best fitted our needs. Final choice was based on performance data furnished us by impartial sources, our own experience, manufacturers' data and price.

In calculating our needs we decided an overall average reduction of 12 to 20 per cent in higher frequencies from our starting point would place the noise of our cleaning room at a safe level. The reduction in noise level already obtained indicated we should work toward an additional overall average reduction of about 8 db. Actually we were 1.1 db under our estimate, achieving a 6.9 reduction. This was satisfactory.

In applying the absorption materials, our hanging pattern was determined by the location and intensity of the noise sources. Worthy of note is the concentration of baffles over grinding wheels which took care of everyone but the operator. A few feet away from the operator noise levels of 87 or 88 db were found while in the operator's hearing zone they were 90 to 91 db. To bring this noise level down a special tool rest was designed. Success of this change was demonstrated by the reduction of two to three db in the overall and as much as five db in the upper frequencies. It's strange to see the sparks but hear no noise.

The above steps were accomplished in the following order:

1. Reduce vibration transmission from tumbling barrels by installing isolation materials at the footings of these machines.
2. Install wood mufflers in bottoms and backs of airless blast tumbler hoppers. These mufflers to be covered with sheet metal to insure longer life and to be isolated from the hoppers by use of isolation materials, bushings and washers on the bolts by which same are attached to hoppers.
3. Treat all the trays used in the cleaning room with sheet metal deadener, spraying four sides on the outside and the bottom of all trays with a 1/4 in. coating.
4. Install sound barriers at the front of the four tumbling barrels. This tends to absorb sound and change the directivity pattern of sound waves emanating from the tumbling barrels.
5. Install fiber glass sound stop baffles. These baffles to be hung on wires about eight feet above the floor in approved patterns.
6. Install tool rests and special arbor washers on grinders.

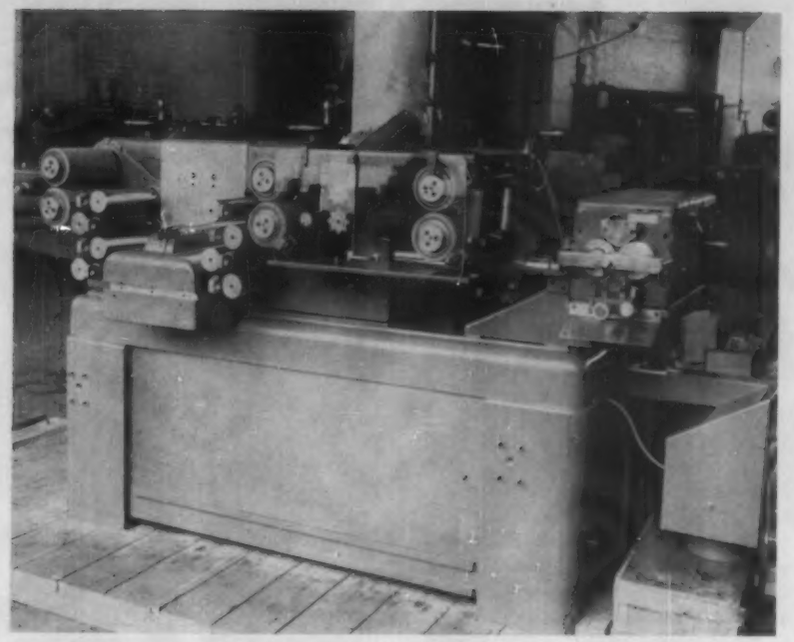
Some further steps are contemplated such as isolating surfaces of benches, quieting ventilation system, etc., but these are minor.

We believe that conclusive evidence that noise can be abated at a reasonable expense is contained in the following tabulation of costs.

1. Isolation of footings of 4 tumbling barrels	361.00
2. Install noise mufflers in 2 airless blast hoppers	300.50
3. Treat trays and barrels and hoppers with sheet metal deadener	320.80
4. Install 4 sound barriers	134.00
5. Apply noise stop baffles to foundry cleaning room	1,453.05
6. Change tool rests and apply washers to wheels	41.87
Total	$2,611.22

Wooden barriers that raise and lower in front of tumbling barrels combine with acoustic absorbers hung from ceilings to cut cleaning room noise.

GRAY IRON CASTING DESIGN SIX CASE HISTORIES

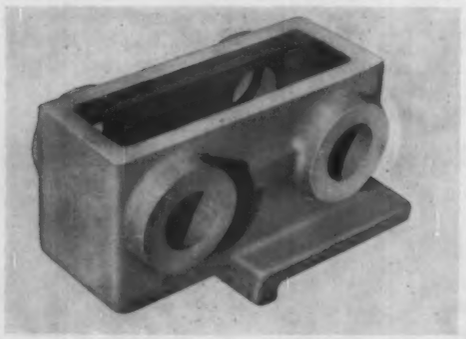


Link-Belt saved their customer $108.90 on each machine by replacing fabricated spindle housing with a gray iron casting. Finished machining time on weldment was 35 hr, on casting only 20 hr. Extensive use of castings (3269 lb) contributes to the machine's rigidity and pleasing appearance.

■ The 1955 annual Redesign Contest of the Gray Iron Founders' Society again produced entries that illustrate advantages of gray iron castings through cost savings, improved performance, design flexibility and weight savings.

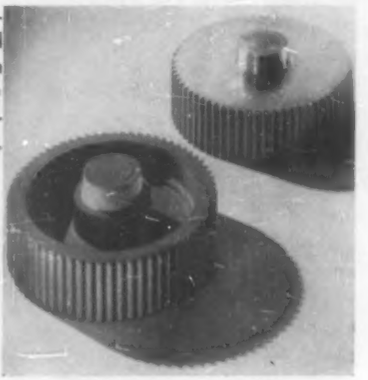
Sharing in this year's first prize of $500 are B. W. Johnson and C. E. Day, AquaMatic, Inc., Rockford, Ill., whose casting reduced machine maintenance. Frank K. Clifford, Olney Foundry, Link-Belt Co., Philadelphia, was awarded the $250 second prize for a gray iron casting that greatly reduced machining time. 1954 first place winner, William S. Thomas, Emmaus Foundry & Machine Co., Emmaus, Pa., took this year's third prize of $100 for a weight-saving, cost-cutting casting.

Honorable mentions were awarded to: Norman J. Pettite, Superior Foundry, Inc., Cleveland, for his many-featured casting; William A. Morley, associate of second-place Clifford, for replacement for multipiece fabrication; and to G. K. Stauffer, Reading Gray Iron Castings, Inc., Reading, Pa., for a pressure casting.



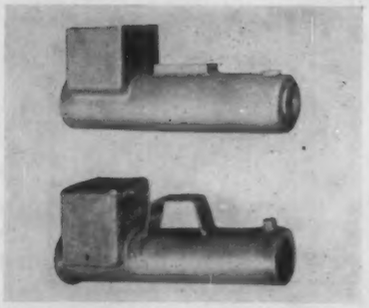
Superior's redesigned cast chainbox for rugged road-building machinery costs less than 50% of 10-part weldment, has better appearance, damping capacity, greater corrosion resistance.

Coal feed ratchet cast by Emmaus foundry not only saved $5.60 from machining it from steel bar stock and cut 30% from its weight, but also automatically identified each part.

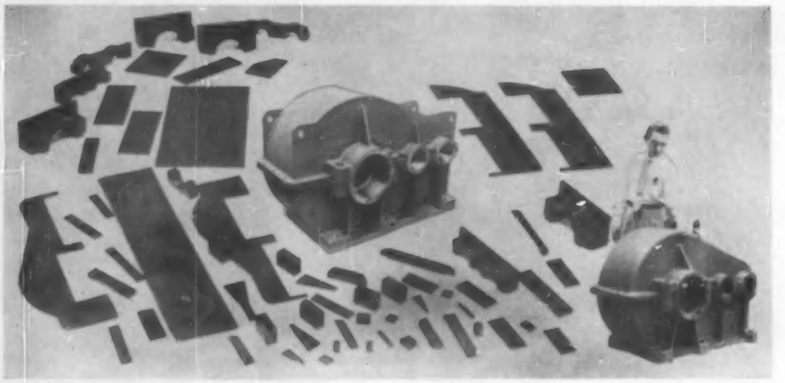


AquaMatic switched from weldment to solve service problem and cut production costs by 70%.

Link-Belt's vibration-absorbing 2-piece gear housing replaced 69 welded pieces, cut material cost 73% and machining 20%.



Reading's oil preheater and viscosity compensator housing tests 200 psi, replaces ugly, expensive, and leaky weldment.



Progress in Taming the Sprue

How mold filling time is affected by sprue shape, aspiration, gate size and location

GORO OHIRA / *Associate Professor*
Tohoku University, Sendai, Japan

■ Gating is considered to be one of the most important factors in getting a sound casting but we still do not know many gating fundamentals. Foundrymen usually develop gating through the cut-and-try method. Therefore, foundry scientists hope to establish general principles for gating by employing experimental techniques to study the phenomenon of metal flow in gating systems.

The aim of the current investigation is to observe the metal flow in gating systems in top, bottom, and step gates, and find out some principles of flow by analyzing it systematically. Similar work has been done by many investigators,[1-4] some of whom used transparent molds and either molten metals or liquids at room temperature.

Experimental technique. The experiments have been done for pure aluminum cast at 750 C. The following technique was applied for the measurement of metal flow in a sand mold.

In Fig. 1, assume *A* to be an inlet, and *BC* to be a casting or part of a gating system. To investigate the metal flow between *BC*, fine wire of high electrical resistance was inserted in such a way as to not interrupt the flowing metal and to be included in *BC* when filled. Weak current was led to the wire and potential difference between the ends was recorded. The molten metal filling this part induced changes in electric resistance which caused variations in potential difference. The variations recorded indicated the flow of metal.

A cathode ray tube was used in this investigation, and potential difference was represented as vertical oscillation of the ray which was recorded with a camera on a paper on a rotating drum. Rotating speed of drum was kept constant in the experiment. Figure 2 is one of these papers from which flow velocity can be calculated.

The lamp method[5] was used in some cases to follow metal flow.

Top gated casting. Molten aluminum was put in a pouring basin

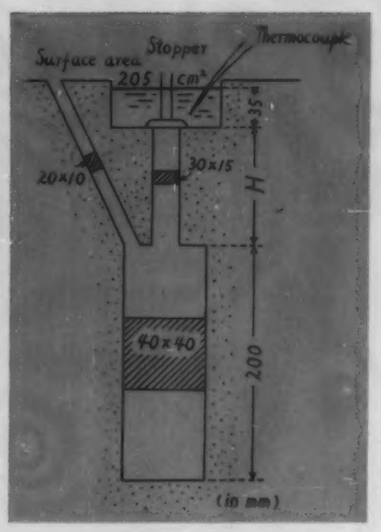


Fig. 3 . . Top-gated casting.

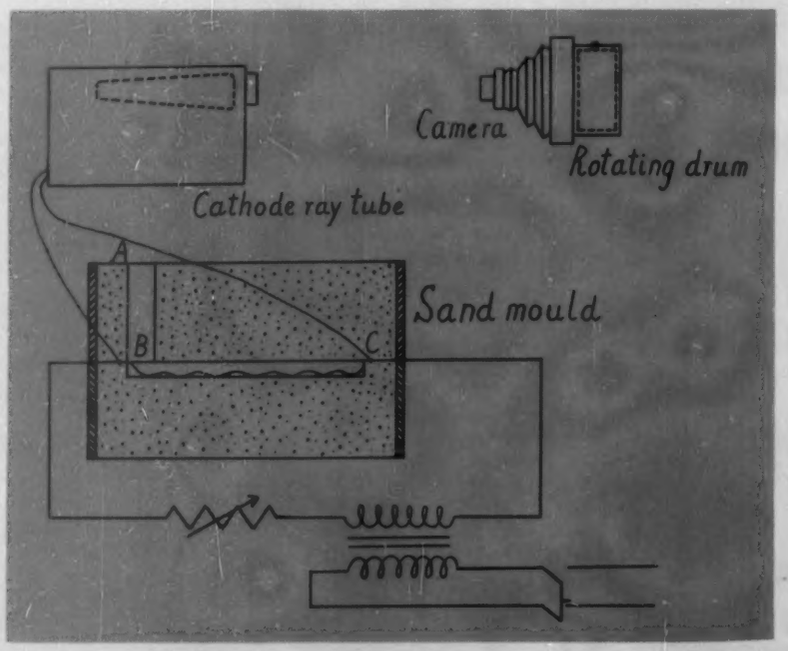
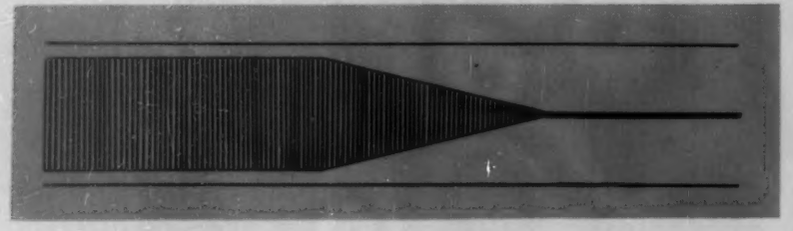


Fig. 1 ◂ and 2 ▾ . . Apparatus and record for calculating flow velocity.



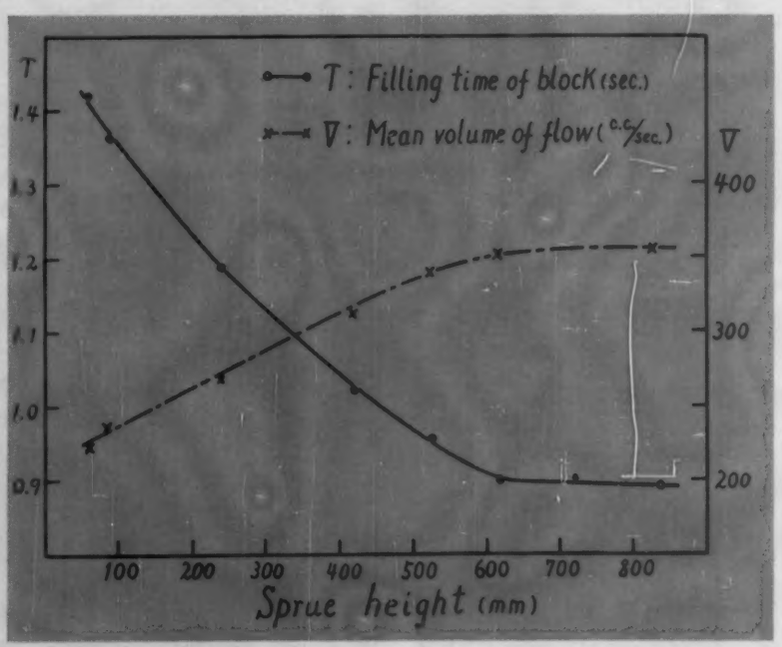


Fig. 4 . . Effect of sprue height on filling vertically gated casting.

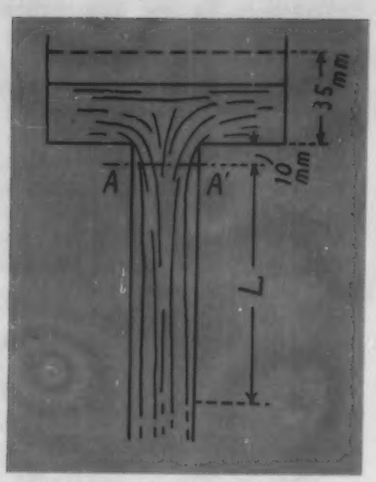


Fig. 5 . . Metal flow in sprue.

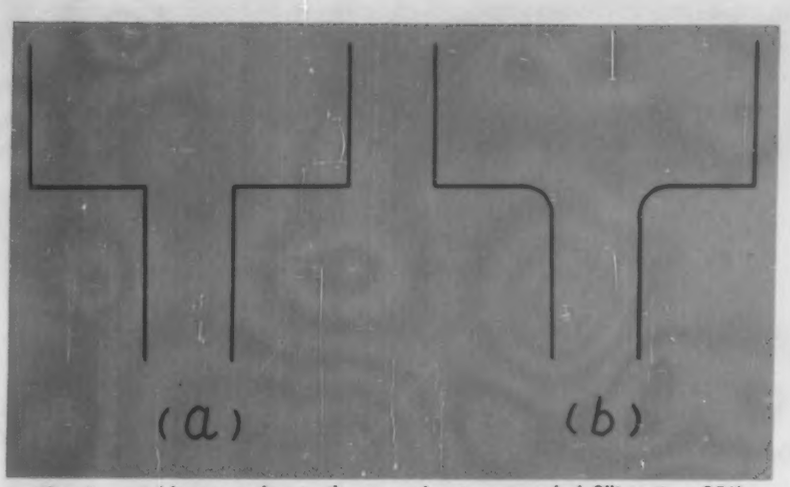


Fig. 6 . . Adding a radius to the sprue juncture speeded filling time 25%.

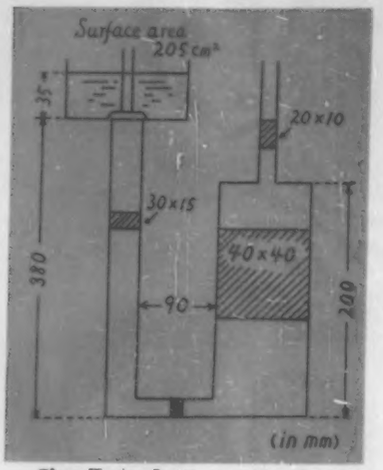


Fig. 7 . . Bottom gate set-up.

TABLE 1 . . SECTIONAL AREA OF FLOWING METAL AT AA'

Sprue height H, mm	60	85	250	420	530	635	850
Sectional area of flowing metal, cm²	2.43	2.50	2.88	3.35	3.57	3.80	3.82
Percentage of original sprue area	54.0	55.5	63.8	74.3	79.5	84.3	84.6

TABLE 2 . . FILLING TIME OF BLOCK IN BOTTOM GATED CASTING

Dimension of gate, mm	Filling time of block and gate, sec	Filling time of gate, sec (calculated)	Filling time of block, sec	Mean volume of flow in the block, cc/sec
15×7	2.02	0.031	1.99	161
20×10	1.60	0.059	1.54	207
25×15	1.36	0.095	1.26	254
30×15	1.42	0.134	1.29	248
45×15	1.90	0.200	1.70	188
55×15	2.20	0.245	1.95	164

TABLE 3 . . FILLING TIME OF SPRUE IN BOTTOM GATED CASTING

Dimension of gate, mm	Time to rise 250 mm sprue and gate, sec	Time to rise 250 mm sprue, sec	Time to rise 200 mm sprue, sec	Time to rise 160 mm sprue, sec
15×7	0.42	0.39	0.31	0.23
20×10	1.08	1.02	0.82	0.65
25×15	1.28	1.18	0.95	0.76
30×15	1.49	1.36	1.09	0.87
45×15	2.34	2.14	1.70	1.37

TABLE 4 . . MEAN VELOCITY OF FLOW AND STATIC PRESSURE HEAD

Dimension of gate, mm	Mean volume of flow in block, cc/sec	Mean velocity of flow in gate, cm/sec	Mean static pressure head, cm
15×7	161	161	13.30
20×10	207	103	5.41
25×15	254	67.5	2.35
30×15	248	55.0	1.55
45×15	188	22.8	0.29
55×15	164	19.5	0.20

with a height of 35 mm (Fig. 3) and was cast at 750 C by removing a stopper. Times to fill a 40x40x200 mm block were measured for different sprue heights (H) and are shown in Fig. 4. Mean volumes of flow calculated from the data are also shown as a dotted line.

Flowing metal increased in volume as the sprue height increased up to a limit which made the flow constant. This was because the falling metal pulled the flowing metal downward by the force of its weight and surface tension, but beyond the certain limit L, the metal dispersed and the pulling action stopped (Fig. 5).

In the sand mold shown in Fig. 3, the section of the sprue was 30x15 mm. At 10 mm below the pouring basin plane (AA' Fig. 5), the falling metal reduced its section compared to the real section of the sprue. Falling speed of metal was calculated at 93.6 cm/sec from the initial height of metal in the basin, and the section of metal at AA' and the percentage to original section of sprue (4.5 cm²) were calculated as shown in Table 1 (refers to Fig. 4).

The shape of the sprue junction with the pouring basin effected remarkably the falling speed of the metal. With a sprue height of 200

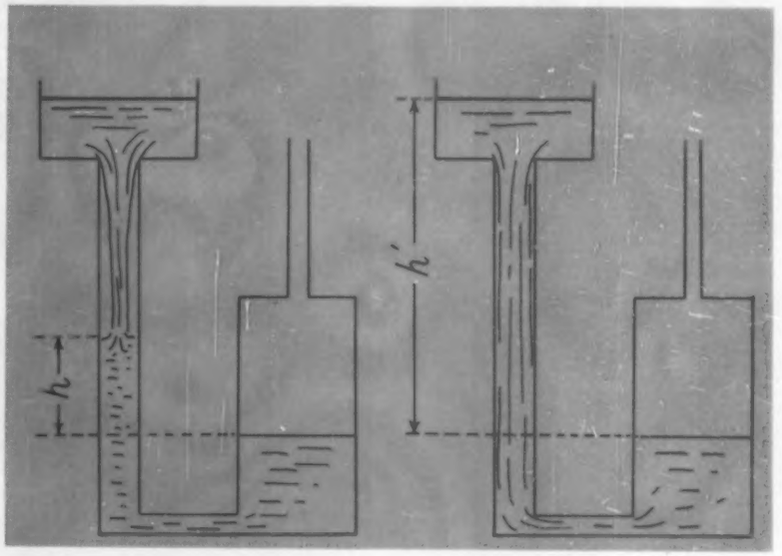


Fig. 8 . . Flow in bottom gated casting—large gate, left; small, right.

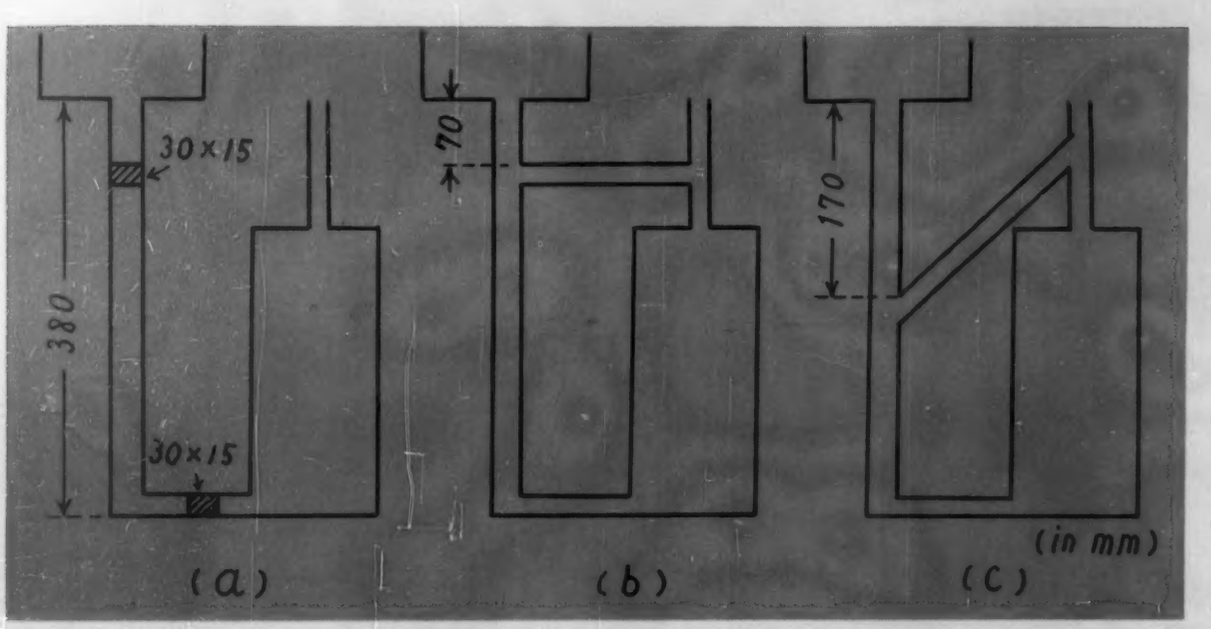


Fig. 9 . . In a test of the effect of aspiration on flow, the higher sprue vent (b) produced the slowest filling time.

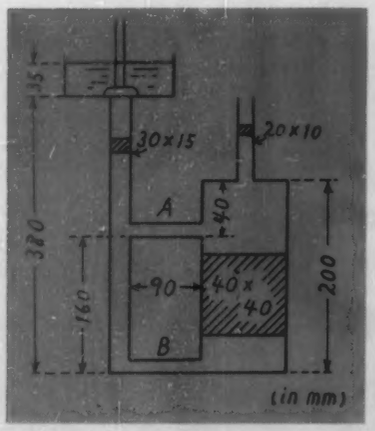


Fig. 10 . . 2-step gate set-up.

mm and the shapes shown in Fig. 6, the filling times of the block 40x40x200 mm were 1.25 and 0.93 sec for *a* and *b* respectively. With sprue *a* in Fig. 6, aspiration occurred, reducing the volume of metal passing through the sprue.

Bottom-gated casting. As to the bottom gating shown in Fig. 7, length of the gate was always 90 mm; cross section varied, 15x7 20x10, 25x15, 30x15, 45x15, and 55x15 mm, respectively. Filling time of the block 40x40x200 mm was measured and is shown in Table 2.

Here the time measured means the filling time of the block and the gate. The flow time of the head of molten metal in the gate between sprue and block was 0.10 to 0.11 sec in spite of the different sized gates, but the filling times of metal in the gate were different according to its size. This was measured in another experiment and is shown in the third column in the table. The filling time of the block only is indicated in the fourth column; the mean volume of flow in the block was also calculated; shown in the last column.

The investigation was made to learn how molten metal enters the block through the bottom gate. For a time after the stopper was removed, metal flowed as indicated in Fig. 8a and continued when the section of the gate was comparatively large. But when it was small, the metal later flowed as in Fig. 8b. Metal was pushed principally by static pressure of head *h* and dynamic pressure of the falling metal from the basin.

Rise of metal in the sprue was also measured by the lamp method with terminals inserted in the side walls of the sprue. Values are indicated in Table 3. Comparison of Table 2 and 3 suggested the static head mentioned above.

Mean velocities in the bottom runners were calculated from the mean values in Table 2, and the static head *h* needed to get these velocities was calculated as shown in Table 4 which confirmed the results of Table 3. Metal filled the block and sprue at almost the same level when the section of gate was large.

In bottom-gated castings, when the sprue was vented to the air (Fig. 9b, c), filling times of block and gate were 1.42, 2.40, 2.28 sec for *a, b, c* respectively. For the block only, they were 1.29, 2.27, 2.15 sec respectively. Side openings in a sprue created aspiration and made it necessary to pour longer to cast the same volume of metal. In other words, the air around the falling metal in the sprue might have negative pressure and if it was opened to the air, dispersion of molten metal mentioned in the preceding section would be promoted causing flow to decrease. The higher the position of the opening, the less was the flow volume.

These results were confirmed not only for the bottom gate but in all cases if the part of the sprue was opened to the air within a certain distance from the basin.

Step-gated casting. In the two-step gate of Fig. 10, sizes of *A* and *B* were varied and the filling time of the block was measured. The

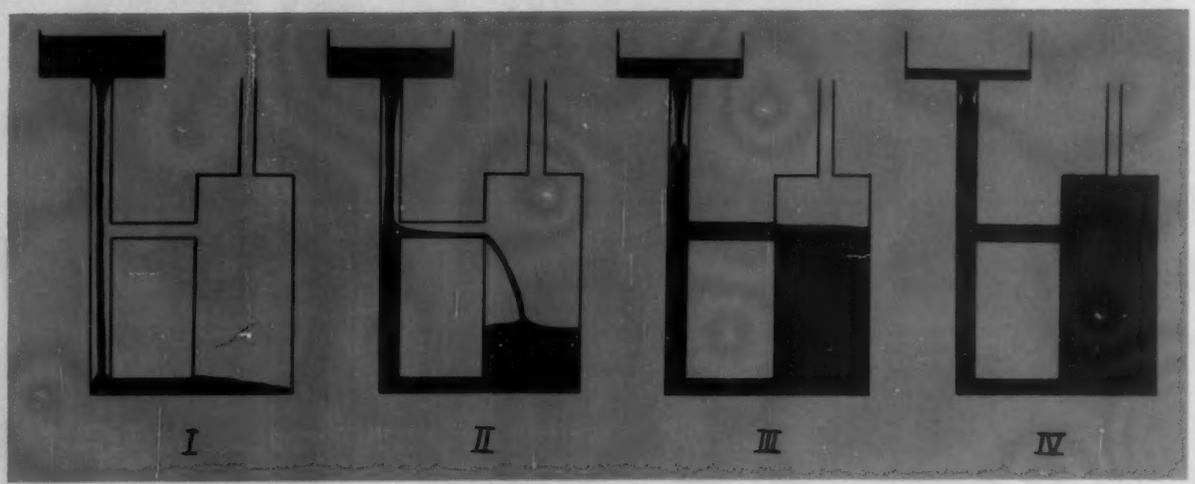


Fig. 11 . . Four stages in the filling of step gated casting for which sizes of top gate (A) and bottom (B) were varied.

TABLE 5 . . TIME FOR STAGES II, III, AND IV IN STEP GATED CASTING

Dimension of gate A, mm	Dimension of gate B, mm	Time for II, sec	Time for III, sec	Time for IV, sec
15×7	15×7	0.20	1.47	1.73
20×10	"	0.24	1.40	1.75
30×15	"	0.25	1.52	1.72
15×7	20×10	0.70	1.52	1.75
20×10	"	0.68	1.58	1.76
30×15	"	0.72	1.60	1.75
15×7	30×15	1.40	1.55	1.84
20×10	"	1.26	1.56	1.80
30×15	"	1.18	1.40	1.78
15×7	45×15	1.50	1.50	1.84
20×10	"	1.41	1.41	1.76
30×15	"	1.60	1.60	1.72

TABLE 6 . . FILLING TIME OF GATE IN STEP GATE (CALCULATED)

Dimension of gate, mm	15×7	20×10	30×15	45×15
Filling time, sec	0.034	0.064	0.144	0.220

metal comes into the block as depicted in Fig. 11 and may be described as follows:

I—The metal begins to enter from a lower gate.

II—The metal begins to enter from a higher gate when the metal surface in the sprue has reached this gate.

III—The metal surface in the block reaches the level of the higher gate.

IV—The block is entirely filled.

The times for II, III and IV from I were measured for each gate (Table 5).

Flow speed of the head of metal in the gate between the sprue and the block was always 0.10 to 0.11 sec for each size of gate, but the filling times of the gate varied with the size. The times in Table 5 are the values corrected by Table 6 which were calculated from another experiment.

Table 5 indicates that the smaller the bottom gate was, the quicker the metal flowed into a higher gate. Comparing Table 3 with Table 5, it is confirmed that the metal flowed into a higher gate when the rising surface of metal in a sprue had reached to the gate, and for a large bottom gate, the metal flowed into a block from the bottom gate to the level of a higher gate.

Summary. Flow of aluminum in top, bottom, and step gates was investigated and the following results were obtained:

1. The shape of the sprue where it is attached to the pouring basin affects metal flow remarkably. Flow rate was increased by rounding the juncture of the sprue to the basin.

2. In direct top gating, metal flow increases with sprue height, but there is a limit beyond which the flow is constant.

3. When a part of a sprue is opened to the air within a certain distance from a basin, metal flow decreases.

4. In bottom gating, the metal enters a mold principally by a static pressure head of metal in the sprue. Flow volume varies according to the size of the bottom gate.

5. In step gating, the entering time into the higher gate varies according to the size of the lower gate.

Acknowledgements. The author would like to express his thanks to Professor I. Igarashi, Tohoku University, under whose instruction and advice the current investigation was carried out. He also wishes to thank J. G. Kura, Battelle Memorial Institute, who helped make this publication possible.

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FEF Holds Campus Meetings

■ Foundry Educational Foundation held three vital meetings on university campuses during the first academic semester.

■ The initial meeting of the FEF Industry Advisory Committee to the University of Kentucky was held. Members present are shown in the picture below. They are: standing, J. M. Kaderly, F. A. Klaene, Robert Martin, Martin Rollman, J. L. Brady, R. E. Napp and E. J. Walsh. Sitting, Ches McCall, R. A. Schroeder, Vernon Swan, Howard Ramsey and Fred Carl.

■ A joint meeting of the trustees of the Foundry Educational Foundation and the University of Illinois FEF Industry Advisory Committee was held on the campus at Urbana, Ill. The meeting represented the first official activity at Illinois since the school affiliated with FEF last summer. The trustees hosted the industry committee at a luncheon shown in the photograph below. Prior to the meeting both groups were entertained in Danville, Illinois, by General Motors Central Foundry Division Danville plant.

■ Discussion at the fall meeting of the Cornell University Industry Advisory Committee to the FEF program centered around the industry's current and anticipated manpower requirements. Members of the committee shown below are: first row, D. J. Merwin, G. V. Smith, R. P. Brewer, A. F. Crone, G. S. Diamond. Second row, C. W. Mason, L. C. Gleason, R. W. Crannell, G. F. Hodgson. Third row, M. L. Harper, Robert Minnear, M. S. Burton, T. R. Walker, D. J. Joyce.

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METAL BLAST
ANNEALSHOT
METAL BLAST
SUPER-ANNEALSHOT
Malleable shot and grit—for less severe cleaning and scale removal. The finest malleable shot on the market!

Here they are—three abrasives that are doing an outstanding job of blast-cleaning all over the country. Abrasives that are performing efficiently and economically—doing thoroughly satisfactory cleaning jobs. It just might be that one of them would improve *your* cleaning operations. And it's easy to find out. Send for a trial order—and see!

THERE'S A METAL BLAST ABRASIVE FOR EVERY CLEANING REQUIREMENT

METAL BLAST, INC.

872 EAST 67th STREET • CLEVELAND 3, OHIO

CIRCLE NO. 108, PAGE 71-72

International Congress Combined With Trade Fair

The International Foundry Congress, to be held in Dusseldorf, Germany, September 1-9, will be augmented this year by an International Foundry Trades Fair. Exhibits will include not only foundry equipment, materials, and processes of all types, but also castings of all known casting alloys produced by the various casting techniques. Special technical-scientific displays are expected to portray the latest developments in machines and methods.

Technical and social meetings running concurrently with the exhibits will be under the direction of the Verein Deutscher Giesserei-Fachleute (Association of German Foundrymen) which with the technical foundry organizations of a number of other countries is represented on the International Committee of Foundry Technical Associations. Co-sponsors of the trade fair with VDG are three other German organizations, the Industrial Association of the Foundry Industry, the Foundry Machinery Trade Association, and the Joint Association of German Metal Foundries.

Fair administration is in the hands of Nordwestdeutsche Ausstellungs-Gesellschaft m.b.H. (NOW EA), Dusseldorf, Ehrenhof 4, Germany.

Penn Clinic Studies Rejects

Erie, Pittsburgh and Jamestown area representatives of the non-ferrous castings industry attended a one-day casting clinic held by Federated Metals Div., American Smelting & Refining Co. January 25 in Erie.

R. A. Colton and D. L. LaVelle conducted the informal discussions, emphasizing the elimination of rejects and methods of producing sounder castings.

The clinic was the fifth in the current series being conducted by Federated Metals Division. Previous clinics were held in Plainfield, N. J., Boston, Rochester, N. Y., and San Francisco. Other sessions will be held where the non-ferrous industry indicates interest.

Crucible Care

■ **Inspect** crucibles immediately upon receipt for damage in transit by tapping the top edge lightly with a hammer handle. A cracked crucible produces a dull sound. If damage is indicated, notify the carrier immediately and call for inspection. He will honor only those claims

made within 15 days after receipt of shipment.

■ **Store** crucibles at a temperature of from 170 to 210 F to minimize moisture pickup and resulting shortened crucible life.

■ **Preheat** ceramic-bonded graphite crucibles before putting them into use by heating them slowly with a low oil or gas flame with reduced air supply. The larger the crucible the slower should be the rate of preheat.

Carbon-bonded silicon carbide crucibles are usually brought to operating temperature as quickly as possible to prevent burning out of the bond before the glaze has had a chance to work out of the crucible wall and set. If there is any question as to proper practice, these crucibles should be started in accordance with recommendations of the individual manufacturer.

■ **Clean the inside** of the crucible after each heat, while it is hot to prevent dross buildup, to shorten melting time, and to reduce fuel consumption.

Charging & Melting

■ **Start the charge** with clean scrap, metal from which molding and core sand, dirt, and oil have been removed completely. Place scrap into the crucible carefully; avoid wedging—the charge, expanding upon heating, may crack the crucible.

Preheat metal before charging by placing it around the furnace cover hole.

■ **Lower (DO NOT DROP)** preheated charge into the crucible with suitable tongs. Do this when melted scrap has formed a pool in the bottom of the crucible.

Feed the crucible as fast as it will take it. Avoid placing metal so that it overhangs the sides of the crucible as this portion will drop into the furnace when melted and produce unnecessary loss.

Run a full crucible of metal, whenever possible; short heats or half-full crucibles are uneconomical. A high metal level in aluminum holding bowls prevents premature failure.

■ **Flux sparingly** and only when necessary. Strongly alkali fluxes attack the crucible; furnace lining life may also be shortened.

■ **Use a pyrometer** of the immersion-type to determine the temperature at which a given alloy produces a satisfactory casting. Take readings while the melt is in the furnace to avoid returning it when temperatures are found to be too low.

Remove the heat from the furnace as soon as the proper temperature is reached, skim, and pour. Overheating is harmful not only to the metal, but also to the crucible and furnace refractories, and besides, it wastes fuel and causes unnecessary metal loss.

■ **Skim dross continuously** while pouring to prevent inclusions from being formed in the casting. Eliminate hand skimming with skimmer crucibles or covers.

■ **Prevent contamination** by using a different crucible for the melting of each specific alloy.

Furnace Maintenance

Check furnace condition periodically. Make routine repairs immediately; refer other difficulties to the crucible furnace manufacturer without delay. High metal quality and operational economy depend on the installation and maintenance of the proper type of refractory.

Furnace linings are usually made of silicon carbide which resists heat shock, abrasion, and erosion.

Since silicon carbide has a high thermal conductivity, it must be backed with a good insulating material to prevent excessive heat loss. Such materials are available as brick, block, cements, and castables.

Furnace linings may be rammed in, using a plastic ramming mix, or installed of prefired shapes that fit the particular furnace.

Because nearly all types of silicon carbide linings tend to grow vertically through oxidation, the top of a new lining should be 1 to 1½ in. lower than the furnace shell. Build up lining flush with shell top with a suitable refractory cement; as the lining grows trim off some of the cement layer.

■ **Proper combustion space** is one of the most important considerations in efficient melting. Unless the flame has an unrestricted path all around the crucible, incomplete combustion may occur.

Make the furnace lining inside

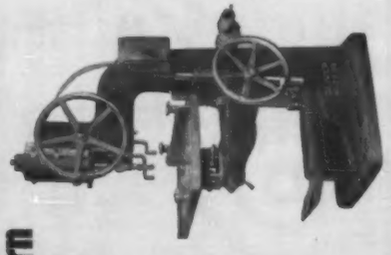
"Tailor Made" from 1 Master Pattern

SCIENTIFIC · MATCH PLATES · Pressure Cast

Eliminate expensive duplicate master patterns! We cast precision aluminum duplicates in one compact mold. Plates are poured under pressure to assure filling all detail. Molding is done in plaster for extreme accuracy. Write for FREE bulletin.

The SCIENTIFIC CAST PRODUCTS Corp.
1390 East 40th St., Cleveland 3, Ohio
2520 West Lake Street, Chicago 12, Illinois
CIRCLE NO. 106, PAGE 71-72

Versatile OLIVER Router-Borer cuts pattern costs!



- For rapid, accurate boring, routing or light shaping, this Oliver is a valuable time-saver.
- It smoothly bores a hole up to 2" diameter, up to 6" deep, in center of 36-inch stock.
- Table measures 20" x 24"; has 12-inch vertical adjustment. Swivels completely around. Tilts 45° in any direction.
- Also offered as an efficient Borer only.

Write for bulletins on No. 72DR Router-Borer and No. 72D Borer

OLIVER MACHINERY COMPANY
Since 1890 GRAND RAPIDS 2, MICH.
CIRCLE NO. 107, PAGE 71-72

diameter about five inches greater than the crucible bilge diameter to provide sufficient clearance for proper circulation of furnace gases and application of lifting tongs.

To provide sufficient combustion space below the bilge for proper mixing and burning of fuel, support the crucible by a base block of suitable height.

Center the crucible in the furnace.

Maintain lining diameter and depth; keep its surface clean and smooth. Wash regularly with a small particle size silicon carbide cement. Clean and patch all holes and surface irregularities with silicon carbide or other refractory cements available for this purpose.

■ **Base blocks and furnace bottoms** are the foundation for long crucible life and efficient furnace operation.

Furnace bottoms may be either performed or rammed plastic refractory.

Base (pedestal) blocks of silicon carbide give level, even support to the crucible at elevated temperatures. Do not use firebrick or cut-off crucible bottoms for base blocks.

Choose a base block with a diameter near that of the crucible bottom. Its height should position the crucible bottom level with the center line of the lowest burner and leave the top two inches below the furnace cover.

Prevent the stationary furnace crucible from sticking to the base block by placing a piece of cardboard on the pedestal before positioning the crucible. In tilting furnaces sticking is desirable as it helps prevent the crucible from shifting.

■ **Furnace covers** made of silicon carbide are strong and long lived. They usually have minimum openings of 6 to 8 in. through which metal is charged and combustion gases are exhausted. Smaller openings tend to choke furnace operation and force combustion gases into the metal.

Before installing a new cover, cap the lining with a layer of silicon carbide cement sprinkled over with a thin coat of coarse sand. The impression made in the cement by lowering the new cover into place forms a smooth, tight seal through which flame and gas cannot escape. Moreover, growth of the furnace lining may be compensated for by cutting down the cement cap.

Prevent excessive sagging and early cover failure with the following recommended practices:

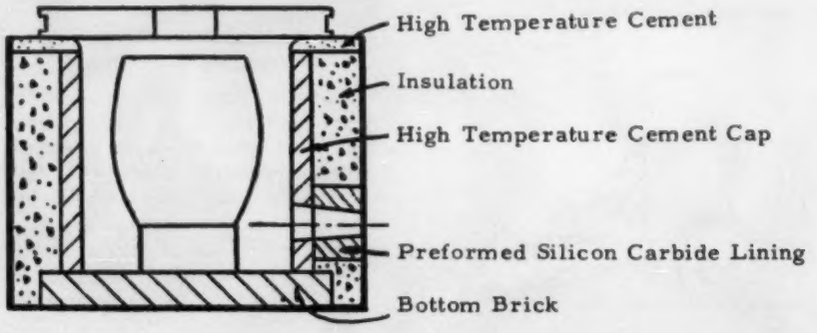
Straighten the supporting band or ring and fit it carefully to the new cover.

Tighten the band on a new cover only after it is heated.

Avoid overloading the cover with preheating ingots.

Select a cover with a diameter sufficient to provide a 3 in. bearing area on each side.

Keep the furnace top smooth and flat so the cover has an even surface on which to rest.



■ **Burner and slag blocks.** Construct the burner port so that flame enters the combustion chamber tangentially and spirals upward. NEVER let the flame impinge directly on the crucible.

A square housing for the burner and burner block is usually welded to the outside of the furnace shell. The burner block may be preformed or rammed; if rammed, dimensions of the mandrel for the burner opening should be obtained from the furnace manufacturer.

Keep the burner port of the burner block clean and smooth to minimize melting time and fuel costs. Seal the burner block tightly to prevent the gas-air mixture from leaking back and burning on the shell. Flame leakage around the burner port may melt or fuse furnace insulation, causing it to run out through the burner port. Both conditions lead to early lining failure.

Select the proper sized slag hole for the particular furnace to avoid fuel waste. Keep the slag hole free from all obstructions so that slag or metal will run out on the floor rather than over the furnace bottom.

■ Condensed from the "Crucible Charlie" bulletins of the Crucible Manufacturers' Association by Robert L. Space, American Refractories & Crucible Corp., North Haven, Conn., chairman, CMA Industry Education Committee.

Produce More Top Quality Castings with Top Quality FOUNDRY MATERIALS

Use these Time-Tested Products for Best Results

SAND
Portage (Wis.) Silica
Century Molding
*Ottawa Blackhawk Silica
Muskegon Lake Sand
Tenn. & Ind. Molding
Utica Crude Silica
Green Lake Shell
*Zircon Sand, Flour and Wash
Berlin Core Sand
Red Flint Annealing
New Jersey Molding
Gallia Red Molding
Albany Molding

BONDING CLAYS
*Volclay, MX-80 (Granular)
*and Panther Creek Bentonite
*Goose Lake Fire Clay
*Grundite Bonding Clay

ABRASIVES
*Tru-Steel Steel Shot
Mollan' Steel Shot and Grit
*Malleabrasive Shot and Grit
*Certified Shot and Grit
*Blackhawk Sand Blast Sand
*Super-Titan Nozzles

REFRACTORIES & MISC.
Cargon Cupola Gun Mix
Firegon Ganister
*Microsil Silica Flour
Fluxing Limestone
*Five Star Wood Flour
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CIRCLE NO. 109, PAGE 71-72

To Tell Engineer's Role at FEF Meeting

■ Castings industry and engineering school representatives will meet March 7 and 8 in Cleveland for the annual meeting of the Foundry Educational Foundation. Featuring discussions of educational as well as foundry activities, the two-day FEF College-Industry Conference will be held at the Cleveland Hotel, Cleveland.

The annual business meeting of the Foundation will be held for the purpose of presenting annual reports and electing officers and trustees. E. C. Hoenicke, FEF president, will preside.

Banquet speaker will be Dr. Deane W. Malott, president, Cornell University. He will speak on *"The New Links Between Education and Industry."*

A panel discussion on use of engineering know-how in foundries and comments of former FEF scholarship holders now active in the castings industry are expected to be of special interest to foundrymen.

New concepts in foundry operation will be depicted in the sound-color motion picture *"To Meet the Challenge"* recently produced by the Central Foundry Div. of General Motors Corp.

The following program has been released by E. J. Walsh, executive director of the Foundation:

Wednesday, March 7

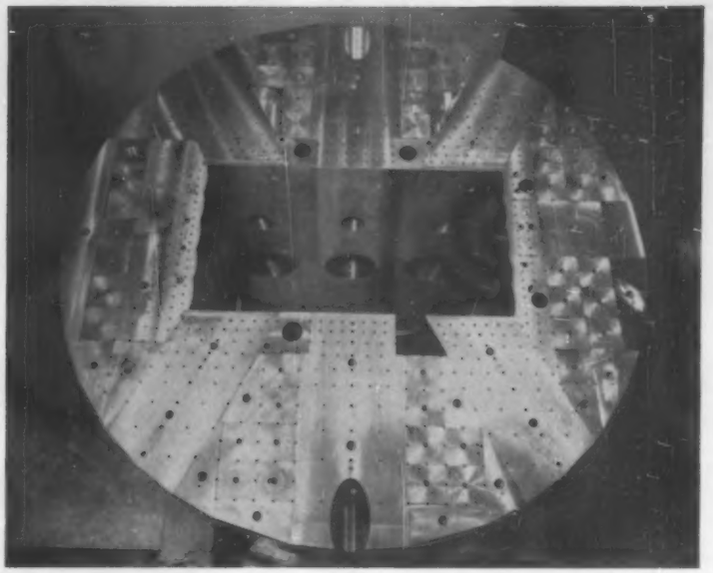
UNIVERSITY DAY

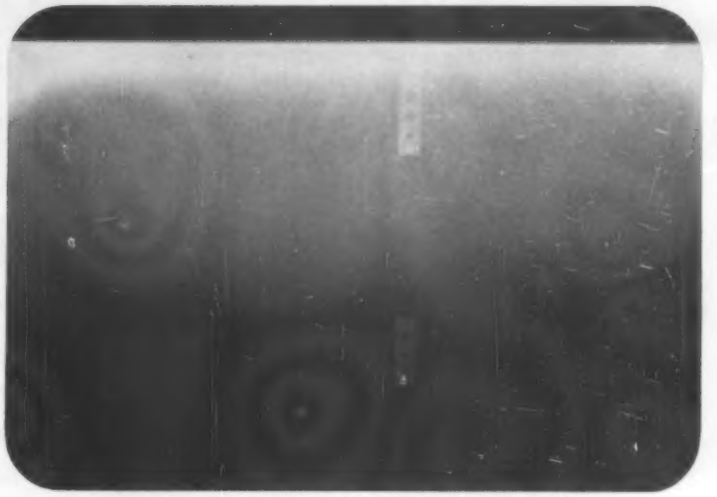
8:30 am . . REGISTRATION
9:00 am . . COMMITTEE MEETINGS
Board of Trustees
Industry Advisory Committee Chairmen
University Advisory Committee
Technical Advisory Committee
10:30 am . . ADDRESS OF WELCOME, E. C. Hoenicke
10:45 am . . *"The Role of Engineering in Foundry Operation,"* Warren C. Jeffery, University of Alabama
"The Co-op Student in the Medium Size Foundry," W. H. Tholke, University of Cincinnati
"The Co-op Graduate in the Medium Size Foundry," Fred Westermann, University of Cincinnati
"Watching Metals Solidify," Malcolm S. Burton, Cornell University
12:00 noon . . LUNCHEON. *"The Economics of Foundry Engineering,"* C. V. Nass, Beardsley & Piper Div., Petti-

ATOM TAMER...

PROVED READY FOR ITS JOB

BY RADIOGRAPHY





Core of Materials Testing Reactor, made up of beryllium blocks, all radiographed for soundness.

BERYLLIUM makes an excellent moderator and reflector in a nuclear reactor. But to do its job and minimize neutron consumption by absorption, it must be especially pure and free of pockets or other faults.

Hence the Brush Beryllium Company radiographed each block used for the core of this reactor after the beryllium powder had been compressed to form the ingot. These radiographs provided proof that no voids existed in the block, no foreign materials had slipped into the pure powder.

Proving soundness of powdered metals in this way parallels the use of radiography in the castings field. It's the sure way to know that no significant voids, gas holes or porosities exist.

If you'd like details on how radiography can work for you, get in touch with your x-ray dealer, or write us for a free copy of "Radiography as a Foundry Tool."

Radiography...

another important example of Photography at Work

EASTMAN KODAK COMPANY
X-Ray Division Rochester 4, N. Y.

CIRCLE NO. 110, PAGE 71-72

Kodak
TRADE MARK

Lindberg-Fisher type MNP nose-pour tilting crucible furnace. Pouring lip is located in the axis of tilting providing a constant pouring arc regardless of degree of furnace tilt. Capacities up to #800 crucible with brass, up to #1000 crucible with aluminum. Oil or gas fired. Described in Bulletin 57-A.

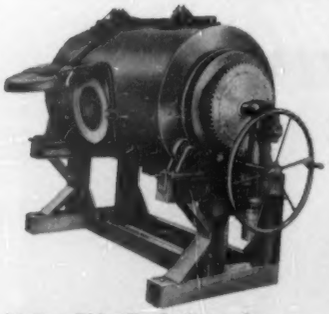
Lindberg-Fisher Electric Resistance Melting and Holding Furnace equipped with heavy duty resistance elements which give uniform distribution of heat, insuring long element and pot life. Capacities 250 to #1000 crucible.

For Non-Ferrous Metals

A complete line of

LINDBERG FISHER

MELTING AND HOLDING FURNACES



Lindberg-Fisher Simplex Rotary Open-Flame Furnace. Capacities to 2400 lbs. aluminum. 6000 lbs. brass. Oil or gas fired. Described in Bulletin 29-A.

For Melting Aluminum • brass • yellow brass bronze • copper • copper nickel alloys • lead magnesium • nickel • tin • zinc.

Because Lindberg-Fisher builds *all* kinds of melting equipment... gas... oil... electric... induction, and Carbon arc... L-F engineers are able to recommend, without prejudice, the proper type of furnace for *your* particular melting requirements.

Lindberg-Fisher type BB1 Hand-Tilt Crucible Furnace. Tilting mechanism consists of a hand wheel, driven through machined worm gear and pinion reducing gears. Capacities 50 to #400 crucible. Oil or gas fired. Described in Bulletin 400.

Lindberg-Fisher type SF stationary crucible furnace features rapid melting and is recommended for general foundry casting work. Capacities 30 to #400 crucible. Oil or gas fired. Described in Bulletin 301.

Melting specialists for 25 years
Sales and service offices in principal cities

LINDBERG FISHER **MELTING FURNACES**

A Division of Lindberg Engineering Company, 2440 West Hubbard Street • Chicago 12 • Illinois

CIRCLE NO. 111, PAGE 71-72

bone Mulliken Corp.

2:00 pm . . *"New Developments in Cast Metals and the Foundry Engineering Student,"* R. A. Flinn, University of Michigan

"The Meaning of Engineering Education and the Foundry Educational Foundation to the Medium and Small Size Foundry," D. S. Eppelsheimer, Missouri School of Mines

"Thoughts on New Developments and Engineering Education in the Castings Field," R. W. Heine, University of Wisconsin

3:00 pm . . FEF ANNUAL MEETING
Report of the President, E. C. Hoenicke
Report of the Secretary-Treasurer, E. M. Knapp, Ferro Machine & Foundry Co.
Report of the Nominating Committee, Stowell Wasson, National Malleable & Steel Castings Co.
Election of Trustees

4:00 pm . . TRUSTEES MEETING

6:00 pm . . RECEPTION AND BANQUET
"The Links Between Education and Industry," Dr. Deane W. Malott, Cornell University

Thursday, March 8

INDUSTRY DAY

9:30 am . . RECOMMENDATIONS OF COMMITTEES
University Advisory Committee
Technical Advisory Committee
Industry Advisory Committee
Chairmen

10:00 am . . PANEL DISCUSSION. *"Application of Engineering in Foundries,"* R. L. Gilmore, Superior Steel & Malleable Castings Co., moderator.
Discussion by castings industry leaders of the practical and profitable applications of engineering know-how to the solution of everyday foundry problems. Emphasis will be on actual experiences common to all foundries regardless of size of metal cast.

12:00 noon . . LUNCHEON

1:00 pm . . COMMENTS BY FORMER FEF SCHOLARSHIP HOLDERS:
Claridon J. Thomas, International Harvester Co.
Ray H. Witt, Cadillac Malleable Iron Co.
Jack E. Bolt, General Electric Co.

2:00 pm . . *"To Meet the Challenge,"* film depicting new concepts in foundry operation. Remarks by James H. Smith, Central Foundry Div., General Motors Corp.

2:30 pm . . CONFERENCE SUMMARY AND RECOMMENDATIONS, E. C. Wright, University of Alabama

Now Where Was That?

■ You will have no trouble locating articles in back issues if you write for the index to 1955 issues of MODERN CASTINGS.

for the asking

Core oils / 8 pages of "facts about the Linoil 700 series" relate oils of this group with sand types, baking time and temperature, cereals, and costs. *Archer-Daniels-Midland Co.*

CIRCLE NO. 41, PAGE 71-72

Dispensed core paste / from a drum of Mabco Reddy core paste by a common barrel pump is economical, efficient, and time saving; eliminates mixing and setting time. Costs given. *M. A. Bell Co.*

CIRCLE NO. 42, PAGE 71-72

Bonding and refractory clays / 4-page brochure tells of the source, processing, and control of line from southern Ohio. *Cedar Heights Clay Co.*

CIRCLE NO. 43, PAGE 71-72

Gear drives / (in-line helical) are described in 16-page Book 2651 giving load classes for over 250 applications, overhung load ratings and

dimension tables, selection instructions, and cutaway views of double and triple reduction drives. *Link-Belt Co.*

CIRCLE NO. 44, PAGE 71-72

Shell molding / 35 mm, 25-min sound, color, film "Shell Molding and You" describes advantages of shell molding, demonstrates operations step by step, explains materials and equipment. *General Electric Co.*

CIRCLE NO. 45, PAGE 71-72

Shot, grit, and cut wire / the 20th Century line of metal abrasives, are covered in 16-page Catalog 1153 which discusses quality controls, selection factors for abrasive and cleaning methods, consumption, and lists SAE specifications. *Cleveland Metal Abrasive Co.*

CIRCLE NO. 46, PAGE 71-72

Direct arc furnaces / with hydraulic electrode arms, top charging features are described in 40-page bulletin FY-168 which shows power consumption, tilting arrangements, controls, and many layouts and photos of furnaces separately and in duplex operations. Gives specifications of furnaces and electrodes; describes charging buckets and substation equipment. *Whiting Corp.*

CIRCLE NO. 47, PAGE 71-72

Powdered phenolic resin / RCI's two-stage Foundrez 7500 for shell molding is described in 4-page technical Bulletin F-3 which also illustrates molding steps; discusses sand selection, pattern design, recent process advances; and lists manufacturers of equipment and suppliers of sand. *Reichhold Chemicals, Inc.*

CIRCLE NO. 48, PAGE 71-72

Pulsating panels / are said to feed stubborn materials uniformly, noiselessly from bins and hoppers by positive displacement of inflated rubber panels. Bulletin describes principal, diagrams application, and lists 8 advantages. *Gerotor May Corp.*

CIRCLE NO. 49, PAGE 71-72

Bentonite and Deformation / News Letter No. 40 defines deformation as the property of a green sand mixture to deform before rupture. It says Volclay gives high plasticity whereas Panther Creek gives low plasticity. It further discusses feel,

These Are the Metal Abrasives That Made Blast-Cleaning History

NOW IN 50-LB. Double Burlap BAGS

Sold and Recommended by PANGBORN CORPORATION Hagerstown, Md.

Since 1886 Pittsburgh Crushed Steel Company has led the metal abrasives industry in product research and improved manufacturing methods to produce better metal abrasives for blast-cleaning.

SAMSON SHOT AND ANGULAR GRIT are the original chilled iron metal abrasives that led in the conversion from sand to metal abrasives for blast-cleaning at the turn of the century — accepted today as the best of their kind.

MALLEABRASIVE is the original patented malleablized type of metal abrasive of greater toughness and longer life, whose development sparked efforts of all other metal abrasive manufacturers to equal it.

TRU-STEEL SHOT is the original super-tough, heat-treated and drawn steel shot of tool steel quality — since 1948 the pace setter in production of the all-steel type of shot.

PITTSBURGH CRUSHED STEEL COMPANY
Arsenal Sta. Pittsburgh (1), Pa.

Subsidiaries:
Globe Steel Abrasive Co., Mansfield, Ohio
Steel Shot Producers, Butler, Pa.

BETTER METAL ABRASIVES FOR INDUSTRY

CIRCLE NO. 112, PAGE 71-72

The New *AUTOMET* is on Display in our New Show Room and Laboratory Visit us for a Demonstration

See the new Buehler Automet Polisher Attachment in operation.
Holds 6—1″ or 5—1¼″ specimen mounts for automatic mass production precision polishing.
The Automet attachment fits all present 8″ Buehler Low Speed Polishers.
Also on display will be the new Buehler Electro Polisher together with other Buehler equipment.
Buehler Ltd. METALLURGICAL APPARATUS
2120 Greenwood St., Evanston, Ill., U. S. A.

CIRCLE NO. 113, PAGE 71-72

metal penetration, shrinks, deep-pocket ramming, mulling time, mold hardness, and fines. *American Colloid Co.*
CIRCLE NO. 50, PAGE 71-72

Hand tools / 44-page catalog SD-56 covers screwdrivers, nut drivers, wood chisels, pliers, kits, specialty tools, and plastic mallets; also has

reference diagrams, correct procedures, hints, and specifications. *Vaco Products Co.*
CIRCLE NO. 51, PAGE 71-72

Induction melting / and holding furnace and automatic pouring unit called the Duplex Ajaxomatic, is described in folder R-48 showing unit in operation, control cabinet, and installation diagram. *Ajax Engineering Corp.*
CIRCLE NO. 52, PAGE 71-72

Accordian sleeves / for protecting vital operating parts of machines are described in bulletin MIS-56 which illustrates several methods of installation. *A & A Mfg. Co., Inc.*
CIRCLE NO. 53, PAGE 71-72

Solid film lubrication / which inhibits fretting corrosion, prevents galling and seizing, lubricates under high loads, high speeds, temperatures from −100 to +700 F (some applications to 1100 F) and produces dry,

clean, dust-free operation is described in Brochure B-3. May be used with oils and greases. *Electrofilm, Inc.*
CIRCLE NO. 54, PAGE 71-72

Polishing and buffing compositions / for aluminum, brass, zinc, regular and stainless steels are described in 16-page bulletin which tells how to test compositions in the plant, and how

to obtain direct personal service and L.V. (laboratory-verified) Reports. *Frederic B. Stevens*

CIRCLE NO. 55, PAGE 71-72

Synthetic fluids and lubricants / 52-page Form 6500D covers properties, applications, and characteristics of polyalkylene-glycol derivatives (in both water-soluble and water-insoluble series) used for mechanical lubricants, hydraulic fluids, heat-transfer fluids, anti-foam agents, solvents, and formulation components. *Union Carbide & Carbon Corp.*

CIRCLE NO. 56, PAGE 71-72

Down draft benches / for collecting dust from snagging, polishing, grinding and any flexible shaft or hand tool operation are described in 8-page bulletin. Turntable and roller conveyor work surfaces are available. *Wolverine Equip. Co.*

CIRCLE NO. 57, PAGE 71-72

Dust and fume collectors / and paint spray booths are described in 6-page Bulletin 1155 which says the firm will design, engineer, fabricate, and install a system to meet any requirement. *Zack Co.*

CIRCLE NO. 58, PAGE 71-72

Crane electrification / 8-page Catalog 2021A is on applications of Inverted-Y Electrification to all makes of cranes and runways. Contains drawings and information for ordering equipment for any normal application requiring current in amounts of 300-1000 amperes. *Cleveland Crane & Engineering Co.*

CIRCLE NO. 59, PAGE 71-72

Automatic bulk scales / 6-page Bulletin 8946A describes Class 38 units: construction, operation, feeding, capacities. Gravity, belt, screw, and vibrating feed arrangements are shown in diagrams. Special features and accessories are covered. *Richardson Scale Co.*

CIRCLE NO. 60, PAGE 71-72

Lathe manufacturer / celebrates 50th anniversary with 80-page catalog on its history, quality controls, and equipment features. Covers all lathes and accessories; also vertical spindle milling machine, bench shaper, pedestal grinder, and drill presses. *South Bend Lathe Works*

CIRCLE NO. 61, PAGE 71-72

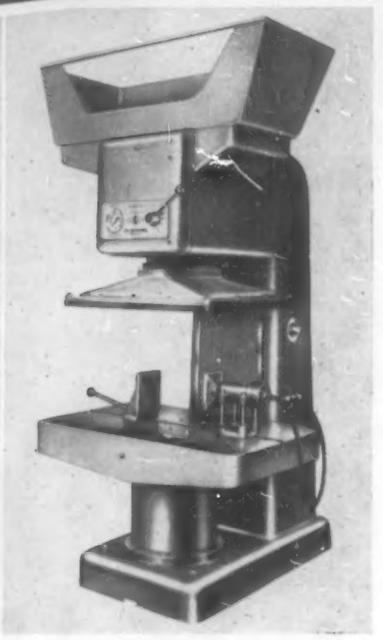
Wood properties / including density, hardness, strength, dimensional stability, decay resistance, ease of splitting, and special comments for 23 species of industrial woods are given in 28-page, hinge-bound "A World

HANSBERG SHOOTERS

FOUR SIZES

Capacities 3½ to 88 Pounds

H1 — Bench Model



H5, H12, H25 — Floor Models

HANSBERG SHOOTERS operate on a new patented principle which produces a SHOOT rather than a blow. This feature distinguishes them from conventional blowers because the sand is ejected suddenly out of the chamber in a compact mass without erosion of the core boxes or patterns.

VENTING is reduced to a minimum because the propelling air does not mix with the sand. Only the initial air in the cavity must be expelled. This air usually can be released through vent holes in the SHOOT HEAD.

HIGH DENSITY cores and molds are made as the result of the impact caused by the shooting action.

HIGH GREEN STRENGTH sands can be used because the exhaust of the trapped air explodes back through the sand to aerate it for the next operation.

WOODEN CORE BOXES can be run on these machines without having the finish marred.

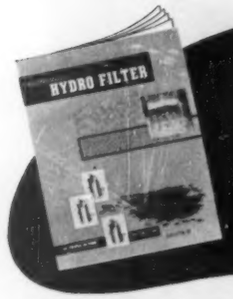
HANSBERG SHOOTERS are ideal for making SHELL cores and molds and are the only machines which successfully handle the sand mixtures for the CO_2 PROCESS.

These machines are ruggedly constructed with simple mechanism to insure low maintenance.

Consult "Davenport" for the solution to your core and mold making problems.

davenport MACHINE and FOUNDRY COMPANY
DAVENPORT, IOWA U.S.A.

CIRCLE NO. 114, PAGE 71-72



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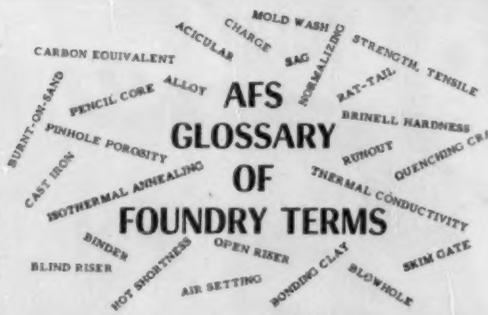

Including almost 2000 terms, this book is intended to help standardize the meanings of foundry terms throughout the metal castings industry. In its preparation, reference was made to many presently existing glossaries and dictionaries of scientific and engineering terms. IT IS THE MOST COMPLETE WORK OF ITS KIND and should be at the finger-tips of every member of the metal castings industry. (80 pp. 6 x 9 Paper Bound.)

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CIRCLE NO. 116, PAGE 71-72

of Wood Products" which also describes wood machining, wood products, buying specifications. *American Wood Working Co.*

CIRCLE NO. 62, PAGE 71-72

Industrial fans / 72-page bulletin 5306 on Series 106 for industrial air and material handling covers fan features, wheels and arrangements, optional construction, and high temperature operation. Includes new Packaged Industrial Fan, rating table terminology, operating limits, and ordering data. *American Blower Corp.*

CIRCLE NO. 63, PAGE 71-72

"Airtube on Target" / 50-page book on pneumatic carrier handling systems, describes several Airtubes and carriers. Case histories of several industrial installations tell what the Airtube does, how it saves money. *Lamson Corp.*

CIRCLE NO. 64, PAGE 71-72

Dust collectors / Cabinet cloth filter and cyclone separator types for grinding, buffing, polishing, sawdust, chips and shavings, and carbon dust are covered in 16-page Catalog 38. Accessories and specifications and price list. *Torit Mfg. Co.*

CIRCLE NO. 65, PAGE 71-72

Gamma ray projectors / Bulletin explains how portability, safety, versatility, and economy of Kel-Ray equipment expands the range of applications to non-destructive testing. Covers spot, hemispheric, and panoramic radiographs; protection from fire, water, shock, and tampering; accessories. *Metal & Thermit Corp.*

CIRCLE NO. 66, PAGE 71-72

Technical advisors / Group of scientists, engineers, and administrators are organized to help top management solve technical and economic problems in the fields of product and process development, diversification, industrial engineering, and applied research. Brochure. *Technical Advisors, Inc.*

CIRCLE NO. 67, PAGE 71-72

Casting grinders / Bulletin MP-10 says you can get all the good in a grinding wheel if you can infinitely adjust the speed of the wheel. Allows proper wheel speed for the job and insures against over-dressing. *Standard Electrical Tool Co.*

CIRCLE NO. 68, PAGE 71-72

Cleaning mills / Bulletins describes line of cleaning equipment, including the continuous, end-loading, end-unloading, automatic star return foundry cleaning mill with capacity of 16

tons of castings per hour. Work comes to and is taken from the mill by conveyors. Castings are always surrounded and supported by stars. *Ransohoff, Inc.*

CIRCLE NO. 69, PAGE 71-72

Abrasive belt grinding / 46 illustrated case histories in 32-page "How Abrasive-Belt Grinding Increases Production" show reduced tooling costs, reduction in stock allowances, machine versatility, and ease of operation. *Engelberg Huller Co.*

CIRCLE NO. 70, PAGE 71-72

Ultrasonic testing / 8-page 50-105 says non-destructive, versatile, portable, simple to operate Reflectoscope by detecting surface and internal defects improves casting quality, reduces costs, and (in preventive maintenance) anticipates breakdowns. *Sperry Products, Inc.*

CIRCLE NO. 71, PAGE 71-72

Industrial radiography / 24-page Bulletin R, "A New Approach to Supervoltage Radiography," as an inspection and quality control tool, discusses several "old wives' tales", lists major characteristics as guide in selection of proper x-ray source, points out need for greater penetration. Case studies. *High Voltage Engineering Corp.*

CIRCLE NO. 72, PAGE 71-72

Electric furnace plan / Under the new DEF Lease Plan, companies may have the important production advantages of Detroit Rocking Electric Furnaces without the capital outlay required for purchase. Bulletin. *Detroit Electric Furnace Div., Kuhlman Electric Co.*

CIRCLE NO. 73, PAGE 71-72

Typical shell cores / Shal-Tec Bulletin 307 illustrates shell cores ranging from 1" to 52" in overall length and from 1 oz. to 5½ lb in weight. Sands range from 30 mesh to 140 mesh. *Shallway Corp.*

CIRCLE NO. 74, PAGE 71-72

Wax injection presses / 8-page bulletin provides specifications, photos, and prices of the Sherwood line for investment casting. Two models feature new, quicker acting mold holding device. *Alexander Saunders & Co.*

CIRCLE NO. 75, PAGE 71-72

High vacuum furnaces / 8-page booklet No. 552 describes and illustrates vacuum furnaces for melting, heat treating, and purification of metals. How ductility, machinability, fatigue resistance, resilience, temperature resistance, abrasion resistance,

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CIRCLE NO. 117, PAGE 71-72

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One of the world's largest producers of quality shot and grit—Hard Iron—Malleable (*Normalized)—Cut Wire—Cast Steel (Realsteel)
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and corrosion resistance are increased. *High Vacuum Equipment Corp.*

CIRCLE NO. 76, PAGE 71-72

Permanent magnetic drums / Applications and features in 6-page MD-200 include protecting process equipment from tramp iron damage and concentrating magnetic from non-magnetic materials. Includes diagrams, performance data and application guides. *Homer Mfg. Co., Inc.*

CIRCLE NO. 77, PAGE 71-72

Metal abrasive / Bulletin says Malleabrasive increases output of cleaned castings, wears out fewer machine parts, lasts 2 to 4 times longer than ordinary shot and grit, describes 30-day proof test. *Globe Steel Abrasive Co.*

CIRCLE NO. 78, PAGE 71-72

Federated metals story / 16 pages on the world-wide organization and facilities for supply and service to the user of non-ferrous metals, both primary and secondary. *Federated Metals Div., American Smelting and Refining Co.*

CIRCLE NO. 79, PAGE 71-72

Core blower / Bulletin says #2 Redford sets new standards, not only because it is fast but also because every motion of the operator offers maximum production with minimum effort. 8 detailed features specifications and illustration, *Redford Iron & Equipment Co.*

CIRCLE NO. 80, PAGE 71-72

Densitometer comparator / is described in eight-page Bulletin 39-B, covering plate scanning mechanism, optical system, electronic system, precision measuring apertures, and speed and convenience of operation. *Baird Associated, Inc.*

CIRCLE NO. 81, PAGE 71-72

CO_2 process handbook / 40-page pocket-size publication on carbon dioxide mold and core hardening procedure covers its history, chemical reaction characteristics, features, and 28 advantages. Discusses carbon dioxide, dry ice converters, binder, sands, mixers, mixes, and mixing; patterns and core boxes, venting, hand ramming and core shooting, blow pipe hardening, high production gassing methods, and automatic apparatus. Has illustrations of equipment, procedures, and castings; and graphs of sand physicals. *Carver Foundry Products Co.*

CIRCLE NO. 82, PAGE 71-72

CIRCLE NO. 118, PAGE 71-72

foundry trade news

Ford Motor Co. . . has announced that it will build an aluminum foundry at Listerhill, Ala., where production of 64,000,000 lb of aluminum permanent mold and die cast auto parts will start in 1957. Molten aluminum will be delivered to the plant direct from a new Reynolds Metals Co. reduction plant adjacent to Ford's building. Companies have signed 10-year contract; largest industrial aluminum order in the industry's history.

Baltimore Aircoil Co., Inc. . . lost foundry and offices in $500,000 fire February 2. Baltimore firm manufactured condensers and air conditioning equipment in a steel sheathed, wood framed building that burned and collapsed. Firm's warehouse and neighboring companies were saved after fire forced 150 persons to flee near-by-houses. Company president John Engalitcheff stated that a date for resuming production could not be set.

Iroquois Foundry . . Racine, Wis., gray iron plant was damaged by a fire that gutted cleaning and core rooms January 21. A. C. Vierthaler, president of the firm, said operations were delayed only a week.

Precision Castings Co., Inc. . . is building an addition to Chicago plant that will double plant capacity.

Fort Die Casting Corp. . . Marysville, Mich., plant has been sold to the group now operating Centr-O-Cast & Eng. Corp. and the Process Machinery Mfg. Co.

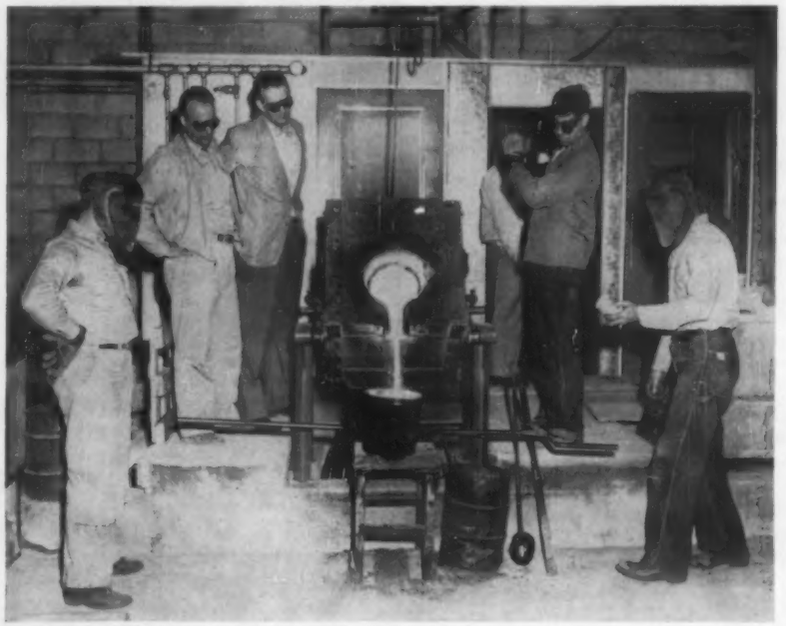
Kearny Smelting & Refining Corp. . . Kearny, N. J., brass and bronze ingot producer has joined American Foundrymen's Society.

Giddings & Lewis Machine Tool Co. . . Fond Du Lac, Wis., organization has established the Kaukauna Machine Corp., purchased last year, as its Kaukauna Machine & Foundry division. Erich C. Wussow heads operation.

Bennett-Ireland, Inc. . . Norwich, N. Y., firm has joined Gray Iron Founders' Society.

Alloy Precision Castings Co. . . Cleveland subsidiary of Mercast Corp., has established departments for investment and shell molding.

Solar Aircraft Co. . . recently brought 20 metallurgists and sales management people from major ti-



Edward J. Querner, above right, vice-president of Fischer & Porter Co., Hatboro, Pa., and Donald J. Volk, above left, president of Alloy Steel Casting Co., wholly owned subsidiary, watch pouring of first casting from first heat at Alloy Steel Casting's new foundry at Southampton, Pa.

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Service records prove that Johns-Manville Pallite outperforms and outlasts many other materials in use in dielectric type furnaces. The advantages of Pallite are due to its special formulation, developed by Johns-Manville for use in dielectric furnace core-drying operations in foundries. Pallite offers the following desirable characteristics:

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Pallite Plates are now available in both flat and grooved form. Pallite Form Driers are also available, contoured to support irregular shaped cores properly during their travel through the furnace. For details about J-M Pallite materials, write Johns-Manville, Box 60, New York 16, N. Y. In Canada, Port Credit (Toronto), Ontario.

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CIRCLE NO. 105, PAGE 71-72

Membership in the American Foundrymen's Society offers unending opportunities for knowledge, ideas, budgeting and planning through the cooperative efforts of recognized authorities. In addition to a constant source of technical-practical help, AFS Membership offers the greatest of all dividends . . . personal contacts with leaders in the same Industry.

The constant interest and active participation of all members, be they executives, supervisors, or foundry workers, is constantly sought and their ideas and opinions welcomed. AFS is essentially a democratic and cooperative organization wherein the will of the majority, as expressed through officers elected by the membership, necessarily governs its every activity and directs its progress.

The benefits of AFS Membership are available in four different Classifications:

SUSTAINING . . . $300

Sustaining Membership is manifestation of the faith of leading foundry companies in the technical work, research activities and educational endeavors of the Society. The extent of the overall program is directly dependent upon available resources derived from Sustaining Membership dues. Participating companies, in turn, have unlimited access to all AFS findings and the privilege of making it possible for any number of company employees, regardless of location within a country, to hold Personal AFS Membership at minimum dues of $10.

COMPANY . . . $100

Company Membership represents an investment on the part of the employer for full membership service for an officially designated representative of the Company, plus the privilege of having employees in all offices or plants, located within the confines of the local AFS Chapter wherein the Company Membership is held, to become Personal Members at minimum dues of $10.

PERSONAL . . . $20

Exceptions: (1) Eligible employees, explained above, of Sustaining or Company Members $10

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JUNIOR . . . $4

The Junior Classification applies to individuals who have not yet reached their 25th birthday (evidence of birth date must be submitted).

After 60 years of service to an International Membership, AFS is acknowledged as the "Inseparable Link to Castings Progress."

AMERICAN FOUNDRYMEN'S SOCIETY

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tanium producers into their Des Moines plant to discuss problems associated with that metal. Solar recently rearranged top management in move "to prepare for substantially expanded production." E. T. Price was elevated to board chairman and exec-v.p. Herbert Kunzel moved into presidency.

American Steel Foundries . . has re-elected Thomas Drever, Charles L. Heater, Ralph D. Brizzolara and Frank W. Jenks to the board of directors.

O. K. Foundry Co. . . . Richmond, Va., plant producing gray iron, brass and aluminum castings, has joined American Foundrymen's Society.

Dewey Bros., Inc. . . . Goldsboro, N. C., firm has joined American Foundrymen's Society.

Calhoun Foundry Co., Inc. . . . Homer, Mich., organization has joined Gray Iron Founders' Society.

National Precision Casting Corp. . . has been acquired by the Beryllium Corp. Deal for Clifton Heights, Pa., firm includes stock of Napco Industries, Inc., Lenni Mills, Pa.

Pemberthy Injector Co. . . . Detroit division of Buffalo Eclipse Co. has joined American Foundrymen's Society.

Holland Furnace Co. . . . Holland, Mich., firm has joined Gray Iron Founders' Society.

Philadelphia Steel & Iron Corp. . . Conshohocken, Pa., plant has been sold to G. J. Keady, Bryn Mawr, Pa., industrialist.

Corning Glass Works . . has established a separate refractories division which will handle their ceramic mold material and other ceramic products.

J. C. Steele & Sons, Inc. . . . Statesville, N. C., manufacturer of brick machinery and other equipment has joined American Foundrymen's Society.

American Steel Foundries . . has published 1955 report to stockholders and has announced 1955 net

AFS Board Contributes To Makemson Memorial

Honoring the memory of the late Tom Makemson, long-time secretary of the Institute of British Foundrymen and perpetual secretary of the International Committee of Foundrymen's Technical Associations, the Board of Directors of the American Foundrymen's Society has made a contribution on behalf of AFS to the Tom Makemson Memorial.

The memorial, to provide an annual award of a Tom Makemson Bronze Medal and prize to the best student in the final patternmaking examination of the City and Guilds of London Institute, was established by IBF to commemorate Mr. Makemson's lifelong interest in students and his service to the castings industry. He helped organize the examinations in foundry practice and patternmaking from their inception. He had served an apprenticeship as a patternmaker and later had taught foundry and pattern shop in addition to working as a patternmaker. Makemson was secretary of IBF from 1926 until his death June 10, 1954.

Contributions to the Tom Makemson Memorial may be sent to the Institute of British Foundrymen, St. John Street Chambers, Deansgate, Manchester 3, England.

Armour Research Aims High

A $5,000,000 building program announced by Armour Research Foundation of Illinois Institute of Technology is aimed at making the foundation "one of the most complete industrial research centers in the world."

Dr. H. A. Leedy, vice-president of the foundation, has stated that it expects to have a 50 per cent increase in research volume and personnel within five years. By 1961 the foundation assumes it will have a research volume of $16,000,000 and a staff of 1600, Leedy stated.

In celebration of its 20th anniversary, the foundation will sponsor a number of events during 1956 to show the importance of industrial research to the nation. One of these will be the first annual National Industrial Research conference to be held April 18 and 19.

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Investment Casters Name Nine New Committees

Nine new committees have been established by the Investment Casting Institute, according to an announcement from its Chicago headquarters.

A Research Committee, headed by K. W. Thompson of the K. W. Thompson Tool Co., has been established to study the investment casting process.

The National Safety Committee, under the chairmanship of R. S. Banister, Midwest Foundry Co., has been set up to study health hazards and safety problems.

The Industry Blue Book Committee, headed by R. R. Miller, Precision Metalsmiths, Inc., will investigate the possibility of publishing an industry directory.

The Wage Survey Committee will collect wage statistics and other labor-management information; it is headed by Harold Hanssen of Howard Foundry Co.

To study better cost accounting methods, a Cost Study Committee headed by Freeman Jones of Misco Precision Casting Co. has been named.

P. W. Schipper of Howard Foundry Co. has been appointed chairman of the Market Research and Statistics Committee.

The University Liaison Committee, headed by Ted Operhall of Misco Precision Casting Co., will cooperate and work with schools and universities.

The Sales Clinic Committee, established to develop plans for regional clinics, will be under the leadership of Nelson Spoth of Kolcast Industries, Inc.

To analyze heat treatment, the organization has also set up a Heat Treatment Committee.

Hold Precipitation Seminar

A seminar for engineers responsible for the operations of electrostatic precipitation equipment will be held at Pennyslvania State University, June 11-15.

Principles of the electrostatic precipitation process and the application of the equipment to public utilities, the steel industry, air conditioning and other uses will be discussed.

income of $1,852,090, $1.54 per share, which compares with a net of $202,424 for 1954.

Brown Industries, Inc. . . . Sandusky, Ohio, firm has joined Gray Iron Founders' Society.

Deemer Steel Casting Co. . . . has installed an arc furnace at their New Castle, Del., steel plant. The unit has two tons per hour melting capacity.

Crompton & Knowles Loom Works . . Worcester, Mass., firm has joined Gray Iron Founders' Society.

Oak Hill Foundry & Machine Works . . Oak Hill, Ohio, plant has joined Gray Iron Founders' Society.

Klotz Machine Co. . . . all facilities of Sandusky, Ohio, firm, including gray iron jobbing foundry, are now operated as Klotz division of Union Chain & Mfg. Co.

Liquid Carbonic Corp. . . . national manufacturer and distributor of carbon dioxide has joined American Foundrymen's Society.

Fate-Root-Heath Co. . . Plymouth, Ohio, firm has joined Gray Iron Founders' Society.

Lone Star Steel Co. . . . earned approximately $1.80 per share in 1955.

C & S Products Co. . . . shell mold equipment manufacturer has moved plant and offices to new location at 12733 Fullerton, Detroit

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Sec. 11—Maintenance and Testing

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In line with the objective, and developed under direction of the AFS Safety, Hygiene and Air Pollution Control Program, *ENGINEERING MANUAL FOR CONTROL OF IN-PLANT ENVIRONMENT IN FOUNDRIES* is designed to:

1 "Assist in the standardization of dust eliminating equipment and improvement of shop operating conditions."

2 "Promote standards for dust elimination and control equipment in cooperation with manufacturers of such equipment."

Here is a factual . . . a reliable . . . foundry reference. It is the kind of dependable, thought-provoking material that should be readily available to every foundry engineer. Copies of *ENGINEERING MANUAL FOR CONTROL OF IN-PLANT ENVIRONMENT IN FOUNDRIES* should be on the work tables of management teams in both large and small plants.

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CIRCLE NO. 129, PAGE 71-72

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27, Mich. Firm recently incorporated as C & S Products Company, Inc.

DeLaval Steam Turbine Co. . . Trenton, N. J., firm has joined Gray Iron Founders' Society.

Vanadium Corp. . . set a record when a furnace repair crew at its Graham plant, Graham Station, W. Va., worked more than 1000 days without a lost-time injury.

Battelle Memorial Institute . . nonprofit Columbus, Ohio, industrial research organization, has published a folio describing their metallurgical research programs.

Charles Wood Corp. . . Marion, Ill., plant has joined Gray Iron Founders' Society.

Waterbury Farrel Foundry & Machine Co. . . has published a booklet describing machinery built by the company.

Engineered Precision Casting Co. . . has released a folder detailing their facilities, policies and personnel.

Allison Co. . . Bridgeport, Conn., plant is now operated as Allison division of American Chain & Cable Co., Inc.

American Brake Shoe Co. . . San Francisco plant has joined Gray Iron Founders' Society.

Koenig Iron Works, Inc. . . is building $425,000 plant northwest of Houston, Texas.

Virginia Metalcrafters, Inc. . . Waynesboro, Va., firm has joined Gray Iron Founders' Society.

Kaiser Chemicals Div. . . $3,000,000 expansion program is planned by division of Kaiser Aluminum & Chemical Corp.

Electro Refractories & Abrasives Corp. . . has established a new product engineering department for its grinding wheel division.

Automatic Temperature Control Co., Inc. . . has announced that its automatic industrial controls will be sold in Chicago area by William B. Parker, Jr., 1915 N. Harlem, Chicago 35, Ill.

Metal & Thermit Corp. . . has elected C. W. Middleton and Lester C. Rogers to its board of directors.

National Malleable & Steel Castings Co. . . declared a dividend of 50¢ on common stock and a 10 per cent stock dividend.

Resources Research, Inc. . . newly formed firm of consultants announced its availability for research and engineering for industry and governmental organizations.

Copper and Brass Sales Co. . . Detroit firm has been appointed distributor for continuous-cast bearing bronze and related products of American Smelting and Refining Co.

Holcroft and Co. . . engineers and manufacturers of heat treat equipment have expanded Detroit plant.

Mathews Conveyor Co. . . Ellwood City, Pa., firm has announced start of construction of new plant and office for Canadian subsidiary, Mathews Conveyer Co. Ltd., near Port Hope, Ont.

Arwood Precision Casting Corp. . . Brooklyn, N. Y., investment casters have named Stampress Eng. Co., Rochester, N. Y., to their representative in western New York.

Link-Belt . . has announced the exchange of shares between Link-Belt and Syntron Co., Homer City, Pa., that makes Syntron a Link-Belt subsidiary.

Bendix Foundries . . Bendix Aviation Corp., Teterboro, N. J., operation has published bulletin describing their facility for handling aluminum and magnesium castings.

Kaiser Aluminum and Chemical Sales, Inc. . . has established a branch sales office in Akron, Ohio.

Rolle Manufacturing Co., Inc. . . has released two bulletins describing their facilities for manufacture of castings. One describes non-ferrous castings, the other investment castings.

NO. 1 Sales Impact IN A 3-PART Package

APRIL OFFICIAL PROGRAM Issue

- . . . sales-provoking impact with industry-wide distribution before the 60th Castings Congress and Show.
- . . . will include complete Official Program of technical sessions, exhibit attractions and special social events.
- . . . ideal "door opener" for those seeking to alert the audience to products and services on display in the big Show—Atlantic City, May 3-9.

BECAUSE the three specially designed issues of MODERN CASTINGS—April, May and June—will reach the identical audience as the 60th AFS Castings Congress and Show, the sales life of the Congress is automatically extended an additional month with each issue.

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is the natural sales companion to the AFS Castings Congress and Show. Be sure that your company takes full advantage of the triple sales impact coming from the three Official Convention Numbers.

modern castings
Golf and Wolf Roads,
Des Plaines,
Illinois

CIRCLE NO. 136, PAGE 71-72

NO. 2 Sales Impact IN A 3-PART Package

MAY BUYERS' DIRECTORY ISSUE

. . . to be circulated internationally during the Congress period, with *bonus distribution* at the Show.

. . . will carry a BUYERS' DIRECTORY of the products exhibited in "The Foundry of Tomorrow"—grouped by subject classifications and keyed to a giant map of the Exhibit Hall for individual booth locations.

. . . Special Section—"The Foundry of Tomorrow"—designed to project your products and services into today's market with tomorrow's sales theme.

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GOLF AND WOLF ROADS
DES PLAINES, ILLINOIS

CIRCLE NO. 136, PAGE 71-72

Principals in the Pittsburgh installation were: front, left to right, G. J. Miklos, Thomas Kaveny, Jr., H. C. Stirling, President, and Harold Erskine. Standing: J. R. Monroe, I. W. Sharp, Wm. W. Maloney, and E. P. Buchanan.

Pittsburgh Group Joins AFS

■ The chapter roster of the American Foundrymen's Society was lengthened to 44 chapters when the Pittsburgh Foundrymen's Association was installed as a chapter of the national organization. The induction of the new chapter took place at a regular PFA meeting January 16 at the Webster Hall Hotel in Pittsburgh.

The Pittsburgh Foundrymen's Association was formed in September 1896, just after the American Foundrymen's Society had come into being in Philadelphia during May. The Pittsburgh group began cooperating with the national group almost immediately and the 1898 edition of the AFS TRANSACTIONS includes the proceedings of PFA. It is noted therein that the group met on Mondays at the Frohsinn Building. Monday night meetings still prevailed in January 1956 when PFA was installed as the Pittsburgh Chapter of AFS.

AFS was already enjoying the technical cooperation of the Pittsburgh group in 1898 when AFS publications show how the Pittsburgh men were rushing research to be discussed at the annual AFS meeting which was held in Pittsburgh in that year. At that meeting, Joseph S. Seaman of Pittsburgh was elected to the presidency of AFS, the third in its young life.

The Monday, January 16, 1956, meeting featured Wm. W. Maloney, general manager of AFS, presenting the cast iron rattle that signifies a new chapter to H. C. Stirling. Others participating in the ceremonies were Harold C. Erskine, Aluminum Co. of America, national director of AFS, and Thomas Kaveny, Jr., Herman Pneumatic Machine Co., national director and regional vice-president of AFS.

The installation included election of officers for the new chapter. Thomas Kaveny, Jr., as chairman of the nominating group presented the slate of candidates to the membership. New officers are: *president*, H. C. Stirling, Rolls Division, Blaw-Know Co.; *vice-president*, E. J. Biller, Vulcan Mold & Iron Co., Latrobe, Pa.; *secretary-treasurer*, E. P. Buchanan, Pittsburgh Coke & Chemical Co.

Elected to membership on the chapters' Executive Committee were: R. H. English, Blaw-Knox Co., Blawknox, Pa.; H. P. Spilker, Sterrit-Thomas Foundry Co., Pittsburgh; J. R. Monroe, Richmond Radiator Co., Monaca, Pa.; G. J. Miklos, Westinghouse Electric Corp., Turtle Creek, Pa.; and I. W. Sharp, American Steel Foundries, Verona, Pa.

Membership chairman of the new chapter is John T. Parsons, Peninsular Grinding Wheel Sales Corp., 3829 Willow Ave., Pittsburgh 34, Pa.

NO. 3 Sales Impact IN A 3-PART Package

JUNE CONVENTION REPORT ISSUE

. . . new equipment roundup, inseparable link to influencing sales with the men who recommend and buy foundry equipment and supplies.

. . . will "carry home" convention developments to 17,000 foundry buyers who look to MODERN CASTINGS for factual writeups and valuable technical data . . . the permanent history of the 60th AFS Castings Congress and Show.

. . . a *plus-value* for sales and future expansion programs resulting from the interest, contacts and lasting impressions created by Castings Congress.

Because the three specially designed issues of MODERN CASTINGS—April, May and June—will reach the identical audience as the 60th AFS Castings Congress and Show, the sales life of the Congress is automatically extended an additional month with each issue of the AFS magazine.

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modern castings

GOLF AND WOLF ROADS
DES PLAINES, ILLINOIS

CIRCLE NO. 136, PAGE 71-72

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in a
Series

in Lansing, Michigan

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American businessmen know a good thing when they see it. The overwhelming preference for Wheelabrator Steel Shot is a good example. Take Michigan's capital city. Wheelabrator Steel Shot is used in 80% of all airless blast cleaning equipment. It is used in 4 out of 5 machines in Lansing because it gives lowest COST cleaning . . . lowest shot consumption, lowest maintenance and highest production. For instance, Lindell Drop Forge Company reports shot consumption decreased 50%, cleaning time shortened 25% and equipment maintenance sharply reduced. Whatever your cleaning problem, wherever you're located, you can save with Wheelabrator Steel Shot. Write now for Bulletin 89-B.

WHEELABRATOR CORPORATION

World's Largest Manufacturer of Steel Abrasives

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CIRCLE NO. 122, PAGE 71-72

Russell J. Anderson Dies

■ Russell J. Anderson, director of manufacturing at Belle City Malleable Iron, Racine Steel Castings Co., died January 20 at St. Mary's Hospital, Racine, Wis., following a lingering illness.

Mr. Anderson, 60 years old, had been associated with the firm for

Russell J. Anderson: he brought the industry before the public.

35 years, starting in 1920 after serving with the armed forces in World War I. During his 35 years of activity in the metal castings industry, he introduced many engineering innovations. He was active in the efforts of technical groups and in promoting the industry. In recognition of these many efforts, the American Foundrymen's Society presented him with the Peter L. Simpson Memorial Gold Medal in 1949.

The citation naming Mr. Anderson as a medalist acclaimed his ". . . exceptional work in bringing the advantages of the foundry industry before the public as an officer of the society's Wisconsin Chapter."

Russell Anderson was president of the Wisconsin Chapter of AFS during 1947-48, and was a member of its past presidents group. He was also a member of the chapter's Officers and Directors Committee and in 1948 was chairman of the Foundry Educational Foundation Industry Advisory Committee to the University of Wisconsin.

Mr. Anderson belonged to ASTM and had been an active member

FOR IMPORTANT NEW SAVINGS IN GRIT BLASTING

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Steeletts, the new steel grit, are proving long life and low cost with results like these: Grit needs slashed 75%, maintenance down 40%, blast time cut 54%. Steeletts are guaranteed to save you money. For more details, write for Bulletin 901-D.

WHEELABRATOR CORPORATION

630 South Byrkit Street
Mishawaka, Indiana

CIRCLE NO. 122, PAGE 71-72

of the Technical Council of the Malleable Founders' Society since 1942. He belonged to the Belle City Twenty Year Club.

Among the other clubs with which he was associated were the Milwaukee Athletic Club, City Club and the Hillcrest Road and Gun Club.

Surviving are his wife, Ellen, two sons, Russell and Vernon, five grandchildren, two sisters, Mrs. L. Thorson and Mrs. C. Hoff, all of Racine.

New Guides Show Hazards Of Common Materials

■ Controls for occupational health hazards in the metal castings industry are included in a newly published group of informative bulletins called *Hygienic Guides*.

Concerned with common industrial materials which present occupational health hazards through toxicity, acute and chronic irritation, the bulletins have been prepared by the American Industrial Hygiene Association. Each bulletin is planned to bring together in concise form the most authoritative knowledge on evaluation and control measures for the material covered by the bulletin.

The first five guides have now been issued. Materials covered by bulletins are acetaldehyde, cadmium, carbon tetrachloride, butyl alcohol and amyl acetate.

Each guide contains information on maximum allowable concentration for short or long term exposure, significant chemical and physical properties, major uses, evaluation of exposures, engineering control and medical control procedures.

The information is planned and presented to be of most use to industry. For example, the discussion of cadmium states that silver solder ordinarily contains about 20 per cent cadmium and that "cadmium fumes have no pronounced odor or immediate effect, but their inhalation may induce, after a few hours, a painful, and sometimes fatal, pneumonitis."

Hygienic Guide sheets may be obtained from the American Industrial Hygiene Association, 14125 Prevost, Detroit 27, at 25c each.

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IT LASTED TWICE AS LONG . . .

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CIRCLE NO. 124, PAGE 71-72

local foundry news

Making the western circuit is Charles Vokac, Whiting. Here he is speaking at the **Oregon** meeting on electric arc furnace melting of iron and steel. Seated is Harry Czyzewski, Metallurgical Engineers, chairman.

Central Ill. guest Harold Weimer, Beardsley & Piper; Ray Heiden, Galva Fdy.; flank $64,000 TV baseball whiz "Paddy" Keough, Gt. Lakes Carbon.

Congratulating **Canton District** speaker A. J. Dublo (l) Sterling Foundry are: H. A. Biddinger, F. E. Meyers & Bros.; F. A. Dun, Babcock & Wilcox; Wendell Snodgrass, Massillon Steel Castings; and D. Crumley, Rockwell Mfg.

Flanked by **North Californians** is speaker Charles Vokac, Whiting. (l to r) Hugh Prior, Superior Electrocast; Leonard Silvey, General Metals; Nino Davi, Pacific Steel Casting; and P. Rodger, Vulcan Steel.

Brass at recent **Timberline** meeting are: A. H. Pat and Joe Talek, directors; Bill Manske, chairman; D rel Durant, program & vice chairman; Chas. Gerbic, direct

Three Timberliners gas at the January chapter meeting.

Program chairman Durant (left) introduces (seated at left) visiting carbon dioxide exponent Roy C. Carver, Carver Foundry Products Co., Muscatine, Iowa.

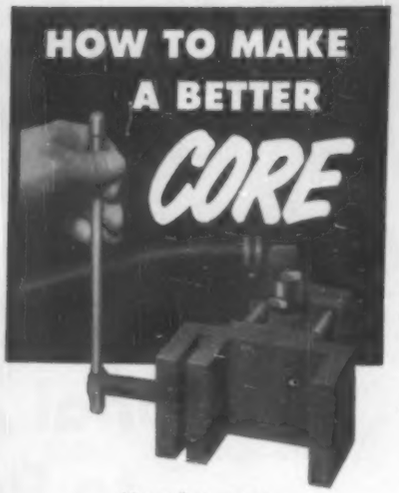
Behind the **Toledo** scene for speaker Arthur Gross, Ohio Steel, was Tom Tillman, Unitcast.

One of 10 in **Ontario** to receive 50-year foundry service pins from G. Ewing Tait, AFS director, is J. Mitchell, Standard Sanitary & Dominion Radiator.

Receiving a check from director Don Fulton, Northern Malleable is E. Eggehasse, first place winner among **Twin-City** entrants in the AFS National Apprentice Contest. The proud fellow on the right is patternmaker Joe Costello, supervisor, American Hoist and Derrick, where Eggehasse is serving his apprenticeship. Costello is chairman of the AFS Pattern Division.

WALT NAPP, DELTA OIL CO.

Wisconsin's program chairman Leslie Woehlke, Grede Foundries produced the January CO_2 bill featuring the AFS movie on the new process and starring Larry Emery, Marion Malleable Iron Works, and Karl Presser, Gray Iron Research Institute, speakers.



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ELIMINATE SLEDGING
INCREASE CORE PRODUCTION
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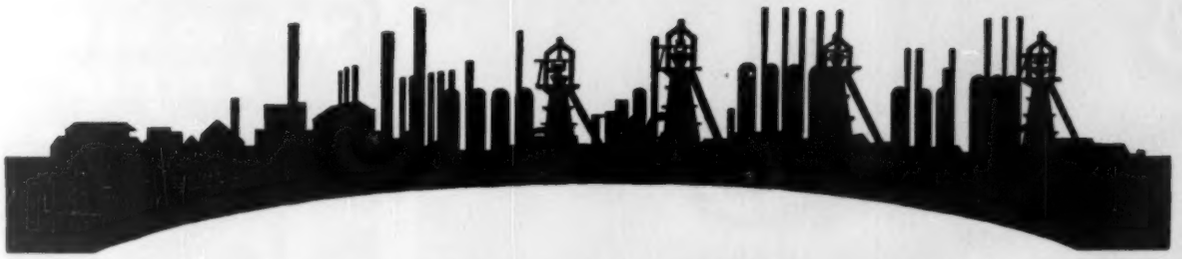
CIRCLE NO. 125, PAGE 71-72



Foundries Praise Woodward's National Advertising Campaign to Promote Cast Iron

Woodward takes this opportunity to thank the many foundries that have expressed appreciation to our Company for its campaign of national advertising to promote the wider use of durable cast iron products.

This campaign, which has been carried on by Woodward for the past two years, has been designed to sell architects, contractors, builders and the general public on the permanence, superior performance and long run economy of cast iron.

Woodward is confident that this campaign has contributed in some degree to the growing sales throughout the nation of cast iron products.

Our Company hopes that you will read these advertisements and give us the benefit of your constructive criticism and suggestions.

For quotations, write or call our Sales Department, Woodward, Ala.
Phone Bessemer, Ala. 5-2491
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609 Bona Allen Building, Atlanta 3, Ga.; 230 North Michigan Avenue, Chicago 1, Ill.; First National Building, P. O. Box 538, Cincinnati 1, Ohio; 1659 Union Commerce Building, Cleveland 14, Ohio; 1203 Ford Building, Detroit 26, Mich.; P. O. Box 335, Duluth 1, Minn.; 412 Guaranty Building, Indianapolis 4, Ind.; 407 Foshay Tower, Minneapolis 2, Minn.; 70 Pine Street, New York 5, N. Y.; 1500 Walnut Street Building, Philadelphia 2, Pa.; 1910 Clark Building, Pittsburgh 22, Pa.; 796 Arcade Building, St. Louis 1, Mo.

Woodward Iron Company

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CIRCLE NO. 126, PAGE 71-72

Spare That Sledge and Saw

■ Applications of magnetic particle inspection, industrial radiography, and stress analysis to the metal castings industry are presented as six technical articles in the recently released SYMPOSIUM ON NON-DESTRUCTIVE TESTING.

The symposium, reprinted from the 1955 American Foundrymen's Society TRANSACTIONS (vol 63), brings together in one publication, papers presented at the 59th Annual Foundry Congress in Houston, Texas, May 27, 1955, that were sponsored jointly by the AFS and the Society for Non-Destructive Testing. A condensation of this material appeared as the Bonus Section of the February issue of MODERN CASTINGS.

In the introduction to the symposium, "Hans J. Heine, AFS technical director, lists 12 methods for non-destructively testing castings and eight flaws often detected, and stresses the need for proven correlation between measured property and service property predicated.

Kermit Skeie, Magnaflux Corp., tells how to increase foundry profits through non-destructive testing.

Francis H. Hohn, Scullin Steel Co., tells how he used x-ray standards and magnetic particle inspection to improve casting methods.

Joe W. Beckham, Texas Foundries, Inc., describes equipment and methods for analyzing casting design with strain gages.

Step-by-step foundry changes that eventually perfected several castings are presented by William D. Kiehle, Eastman Kodak Co.

Basic aspects of radiography: penetrameters, film density, lead screen thickness, geometric unsharpness, and tube voltage are discussed by K. G. Roberts, Naval Research Establishment, Halifax.

Jewell N. Ketchbaw, Industrial Welding & Testing Laboratory, tells how a few dollars of gamma radiography improved quality.

To receive the 28-page, 8¼ x 11¼ in., paper bound, SYMPOSIUM ON NON-DESTRUCTIVE TESTING, write American Foundrymen's Society, Book Department, Golf & Wolf Roads, Des Plaines, Ill. AFS member price is $1.00; non-member, $1.50. Postage will be prepaid if remittance accompanies the order.

Technical Committees of AFS to Meet

■ Technical committees of the American Foundrymen's Society will coordinate their activities during a series of committee meetings in Chicago June 4-8 at the LaSalle Hotel. Known as Committee Week, the series of sessions includes a meeting of the Technical Council of the society.

Committees from six of the eight technical divisions of the society will hold meetings as a part of a program intended to promote advance planning and closer coordination of technical activities.

The Technical Council, formerly called the Technical Correlation Committee, includes the chairmen and vice-chairmen of the society's divisions and the chairmen of its general interest committees. F. B. Rote, Albion Malleable Iron Co., will act as chairman for the meeting of the Technical Council. Rote is also chairman of the Malleable Division.

The program of committee meetings has been arranged as follows:

Monday, June 4

9:30 am . . *Steel Division*—Executive and Program & Papers Committees.

12:15 pm . . Joint Luncheon.

2:00 pm . . *Malleable Division*—Executive and Program & Papers Committees. *Pattern Division.*

Tuesday, June 5

9:30 am . . *Sand Division*—Executive Committee.

12:15 pm . . Luncheon.

2:00 pm . . *Sand Division*—Executive Committee.

Wednesday, June 6

9:30 am . . Technical Council.

12:15 pm . . Luncheon.

2:00 pm . . Technical Council.

Thursday, June 7

9:30 am . . Board Research Committee (with chairmen of Divisional Research Committees).

12:15 pm . . Luncheon.

2:00 pm . . Board Research Committee (with chairmen of Divisional Research Committees).

Friday, June 8

9:30 am . . *Gray Iron Division*—Executive and Program & Papers Committees. *Education Division*—Executive and Program & Papers Committees.

12:15 pm . . Joint Luncheon.

2:00 pm . . *Gray Iron Division*—Executive and Program & Papers Committees. *Education Division*—Executive and Program & Papers Committees.

Crane Builders' Group Elects Officers

Newly elected president of the Electric Overhead Crane Institute is Joseph T. Sohn, center, Bedford Foundry & Machine Co. Other officers elected during the group's recent meeting in New York were, left to right, W. A. Morgan, Morgan Engineering Co., director; H. T. Florence, Cleveland Crane & Engineering Co., vice-president; Sohn; F. M. Blum, Harnischfeger Corp., director; and A. R. Walkley, Manning, Maxwell & Moore, Inc., director. Joe H. Peritz heads group's new Washington, D. C. offices.

Product Improvement Meetings Scheduled

Initiating the American Foundrymen's Society Chicago Chapter series of three educational meetings on product improvement will be the regular chapter meeting on March 5 at which N. Levinsohn, Minneapolis-Moline Co., Minneapolis, will speak on *"Producing Quality Castings."* This session will be held at the Chicago Bar Association as usual with dinner at 6:30.

The series continues on succeeding Mondays at 7:00 pm at the Peoples Gas Light & Coke Auditorium, 122 S. Michigan. On March 12 Harold H. Johnson, National Malleable & Steel Castings Co., Cleveland, will speak on the improvement of castings through improvement of materials and processing. On the 19th Robert F. Thomson, Research Laboratories Div., General Motors Corp., Detroit, presents *"Planning for the 20th Century Foundry."*

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MABCO Iron Filler

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HOUSTON DENVER

CIRCLE NO. 127, PAGE 71-72

afs chapter meetings

MARCH

1 . . Canton District . . Elks Club, Alliance, Ohio. John A. Rassenfoss, American Steel Foundries, *"Hot Tears In Steel Castings."*

5 . . Central Indiana . . Athenaeum Turners, Indianapolis. Hans J. Heine, technical director, American Foundrymen's Society, *"Improved Foundry Technique."*

5 . . Metropolitan . . Essex House Hotel, Newark, N. J. Management Night. Leo P. Flood, New York City Air Pollution Control Board, *"Air Pollution Control."*

5 . . Central Illinois . . Legion Hall, Peoria, Ill. Ray Cochran, R. Lavin & Sons, *"Causes and Corrections of Aluminum Casting Defects."*

5 . . Chicago . . Chicago Bar Association, Chicago. N. Levinsohn, Minneapolis-Moline Co., "Producing Quality Castings." First meeting of educational course on product improvement.

6 . . Rochester . . Hotel Seneca, Rochester, N. Y. William Romanoff, H. Kramer & Co., *"Brass & Bronze Foundry Practice."*

7 . . Toledo . . Toledo Yacht Club, Toledo, Ohio. *"Steel Foundry Practice."*

7 . . Corn Belt . . H. L. Smith, American Smelting & Refining Co., *"Non-Ferrous Problems."*

8 . . Northeastern Ohio . . Tudor Arms Hotel, Cleveland. T. E. Barlow, Eastern Clay Products Div., International Minerals & Chemical, *"High Pressure Molding."*

9 . . Philadelphia . . Engineers' Club, Philadelphia. Hans J. Heine, technical director, American Foundrymen's Society, *"CO_2 Process."*

9 . . Eastern Canada . . Mount Royal Hotel, Montreal, Que. Panel Discussion.

9 . . Southern California . . Rodger Young Auditorium, Los Angeles. Frank S. Brewster, Brumley-Donaldson Co., *"Sand Problems."*

9 . . Central New York . . Onondaga Hotel, Syracuse. Frank Steinebach, editor, *Foundry*, *"Selling Castings."*

12 . . Chicago . . Peoples Gas Light & Coke Auditorium, Chicago. H. H. Johnson, National Malleable and Steel Castings Co., *"Existing Foundry Processes and How to Improve Them."* Second meeting of educational course on product improvement.

12 . . Cincinnati District . . Suttmiller's Restaurant, Dayton, Ohio. Tom Alford,

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Nine sales and service offices are strategically located in the major steel producing centers as shown on the map above. If you have a problem on metals or alloys, let one of our experienced metallurgists or sales engineers help you. He will be glad to assist you with any problems on the production of quality steels, irons, and non-ferrous metals. Simply telephone or write the ELECTROMET office nearest you.

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CIRCLE NO. 128, PAGE 71-72

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Our plants have been greatly expanded and modernized to meet the current demands for ferro-alloys and metals. The recently completed plant at Marietta, Ohio, is the world's largest ferro-alloy plant. Company-owned power facilities at four of the plants assure a constant supply of power for efficient production. Prompt shipment of ELECTROMET ferro-alloys is assured from all seven plants, and from six warehouses conveniently located to serve you.

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The availability of ores, and other raw materials is assured by ELECTROMET's diverse facilities, including mines and ore milling plants owned by UNION CARBIDE. Helping to assure adequate ore supplies are the ore buying facilities of Union Carbide Ore Company, a Division of Union Carbide and Carbon Corporation. Ores come from the far corners of the earth to ELECTROMET's plants. On this simplified map of the world, symbols for the chemical elements indicate a few of the major sources of alloy ores.

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Wheland Co., *"Common Sense in the Coreroom."*

12 . . Northern California . . Spenger's Restaurant, Berkley, Calif. Cleaning Room Symposium.

12 . . Michiana . . Club Normandy, Mishawaka, Indiana. Irving E. Ingraham, Giffels & Valet, Inc., *"The Engineering of Foundry Facilities."*

12 . . British Columbia . . Vancouver Vocational Institute. Prof. W. Armstrong, University of British Columbia, *"Simple Metallurgy."* First meeting of educational program.

13 . . Twin City . . Covered Wagon, Minneapolis, Minn. Warner Bishop, Archer-Daniels-Midland Co., *"Common Sense in the Coreroom."*

15 . . Detroit . . Plant Visitation.

16 . . Texas . . Western Hills Hotel, Fort Worth. Clyde A. Sanders, American Colloid Co., *"What Sand for What Type of Casting."*

16 . . Birmingham District . . University of Alabama, Tuscaloosa. Hans J. Heine, technical director, American Foundrymen's Society, *"Casting Clinic."*

19 . . Chicago . . Peoples Gas Light & Coke Auditorium, Chicago. Robert F. Thomson, General Motors Corp., *"Planning for the Twentieth Century Foundry."* Third meeting of educational course.

19 . . Quad-City . . Hotel Fort Armstrong, Rock Island, Ill. A. D. Matheson, Kelsey-Hayes Wheel Co.

19 . . Philadelphia . . Engineers' Club, Educational Session. Non-Ferrous Round Table. Discussion leader—Philip J. Keeley, Northern Bronze Corp.

19 . . British Columbia . . Vancouver Vocational Institute. Paul Hookings, Major Aluminum Products, *"Gases in Metals."* Second meeting of educational program.

21 . . Central Michigan . . Hart Hotel, Battle Creek. R. F. Thomson, Research Laboratories Div., General Motors Corp. Management Night.

21 . . Oregon . . Heathman Hotel . . Portland. Local plant tour.

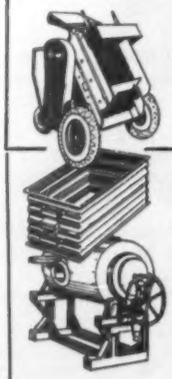
23 . . Ontario . . King Edward Hotel, Toronto, Ont. A. L. Gardiner, *"Cleaning Room Economics."*

23 . . Tennessee . . Patten Hotel, Chattanooga. Management Night.

23 . . Chesapeake . . Engineers' Club, Baltimore, Md. Harry H. Kessler, Sorbo-Mat Process Engineers, *"Gray Iron Foundry Practices."*

26 . . British Columbia . . Vancouver Vocational Inst. Panel: *"Rigging in the Foundry."* Third meeting of educational program.

June 28-29 . . 13th Annual Chapter Officers Conference of the American Foundrymen's Society. LaSalle Hotel, Chicago.



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STEEL APRON CONVEYORS:
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Palmer-Bee—30″ x 19′, 30″ x 5′6″

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1—Link-Belt 27″ x 70′6″, 35 cars 38″ x 72″

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7—Whirlpool Duplex, 800 CFM, 100″ wide x 65″ deep x 90″ high. Buffalo exhausters—7½ HP., 220/440

We buy and sell one piece of equipment or complete Foundries.

FOR SALE: Complete Gray Iron Foundry with #7 Whiting cupola. 18,000 sq. ft. R.R. siding.

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Inseparable Link to Castings Progress.. 70
Engineering Manual 73
Foundry Sand Testing Handbook..... 74
Take a Peek..... 25
AFS Glossary of Foundry Terms 66
Beardsley & Piper Div.
Pettibone Mulliken Corp. .....9 & 10
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Sutter Products Co. 86
Agency—Gray & Kilgore, Inc.
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Whiting Corp. .....Outside Back Cover
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HELP WANTED

WELL ESTABLISHED NEW ENGLAND GRAY IRON FOUNDRY specializing in Job lot production of the Highest qual'ty machine tool castings is seeking a Foundry Superintendent. Applicant must have a sound knowledge of foundry practice and at least ten to fifteen years experience in medium and heavy casting work. Practical experience in coremaking, molding, melting and cleaning is necessary. Some technical training is highly desirable. Replies confidential. Send fully detailed resume giving experience, training and salary requirements to **Box C110, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

SALESMAN — Well established metal warehousing handling foundry alloys, has need for a salesman to call on iron and steel foundries in Wisconsin and Minnesota. Headquarters in Milwaukee. **Address Box C111, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

FOUNDRY ASSISTANT needed by captive gray iron foundry or medium size heavy process machinery manufacturer. Young college engineer graduate preferred. Should have had some foundry experience. Is to help increase plant efficiency, planning, research and operation. Company has liberal profit sharing plan. Salary open. Location S. E. Penna. **Reply Box C65, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

ENGINEERING EDITOR National technical magazine, permanent, immediate, Chicago suburb. Original plant writeups, rewrite, editing. Some travel. Familiarity with metal castings and engineering essential. Foundry engineering experience desirable. Ability to write rapidly, clearly, accurately required. State experience, education, age, salary requirements. Enclose samples of writing. **Box C107, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

METALLURGIST Midwest production gray iron Foundry requires services of man capable of taking charge of metal and sand laboratory and supervising cupola and electric furnace operations. Please advise qualifications and salary. **Box C114, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

BIG OPPORTUNITY FOR METALLURGIST WITH NON-FERROUS CASTING EXPERIENCE

One of Michigan's largest foundries—located in a city of 100,000 only a few miles from the midwest's greatest fishing, hunting, boating and vacation areas—is starting a research and development program in non-ferrous castings. They need a top notch, experienced non-ferrous metallurgist. Must have college degree and potential to assume considerable management responsibility as program develops. Excellent salary, many security and extra benefits and a pleasant life for you and your family in a prosperous, stable, largely home owned, medium size city. Write resume of qualifications to: **Box C115, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines.**

FOUNDRY FOREMAN to supervise Molding Unit production of light and medium castings in mechanized Gray Iron foundry in St. Louis district. Applicant must have good educational background and experience in mechanized foundry. Excellent opportunity for advancement. Reply **BOX C116, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

REPRESENTATIVES WANTED

SEVERAL EXCLUSIVE TERRITORIES for aggressive organizations now calling on foundries, all types. No supply houses wanted unless you offer capable equipment engineering and service. Nationally advertised, well known line includes shell molding equipment, core blowers, core draw machines, combination blower and draw machines, molding machines, miscellaneous foundry equipment, custom-building and testing equipment. Liberal commissions. **Box C91 MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

FOR SALE

FURNACES FOR SALE

10 used Heat Treating Furnaces, and two 7-ton gantry cranes, good condition, priced to sell.

BAER STEEL PRODUCTS, INC.
Box 1428
Boise, Idaho

FOR SALE 2—New Diamond Cherry Wood slip flasks, 18 x 18 x 6 C x 4 D, 3 D Taper ¾" double pins each end. 15—Type E T Jackets, 18 x 18 x 7 to fit, 4½ on x 2½ on D. Above brand new, never used, big discount. **Box C113, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

POSITIONS WANTED

Al. and Mg. Foundry Engineer. 12 years in supervisory position in development and production of aircraft castings. Extensive experience in Al-fin, CO_2, toolmaking, development and relating fields. Now with leading company. **Box C112, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

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Foundry Sand Engineer.
Consulting . . . Testing.
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Modernization, Processing Layouts
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WANTED TO BUY
¼ OR ⅛ TON ACID
ELECTRIC FURNACE
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Golf and Wolf Roads,
Des Plaines, Ill.

WANTED TO BUY—1 #2 Simpson Muller. Must be in good condition and priced reasonably. **Avondale Stove & Foundry Company, P.O. Box 5385, Birmingham, Alabama.**

MORE FACTS on all products, literature, and services shown in the advertisements and listed in Products & Processes and in For the Asking can be obtained by using the handy Reader Service cards, pages 71-72.

EMPIRE
"THAT GOOD"
FOUNDRY COKE
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2201 First Ave., North Birmingham 3, Ala.
Phone 3-9135

CIRCLE NO. 132, PAGE 71-72

NEW Aerovent low-speed belt-driven LS FANS

for cooling • drying • exhausting • fume dispersal • heat transfer

New Aerovent "LS" Belt-Driven Fans, designed with new 4-blade "Macheta" Airfoil Propellers, provide high-volume air movement with slower motor speeds and lower horsepower requirements.

Available in sizes 24" to 48" for capacities to 31,800 CFM, they offer greater efficiency and economy against resistances to ¾" SP than direct-driven types operated at identical horsepower ratings.

write for free folder L-750

All Aerovent Fans are rated in accordance with the Standard Test Code and U.S.D.C. Comm. Std. CS178-51.

Aerovent Fan Company, Inc.
Ash and Burch Streets Piqua, Ohio

CIRCLE NO. 130, PAGE 71-72

CHILL KOOLHEAD NAILS

Chill Nails and Spiders for... ACCURATELY CONTROLLED FOUNDRY CHILLING

Write for samples and prices

Choose any style from Jumbo to Stubby; slim, medium or horse nail blade; blunt, pointed, straight or 90° bent. There's a type and size Koolhead Chill Nail or Spider Chill to do your specific chill job best.

You can rely on "KOOLHEAD" and "STANHO" products

STEEL Stanho PRODUCTS

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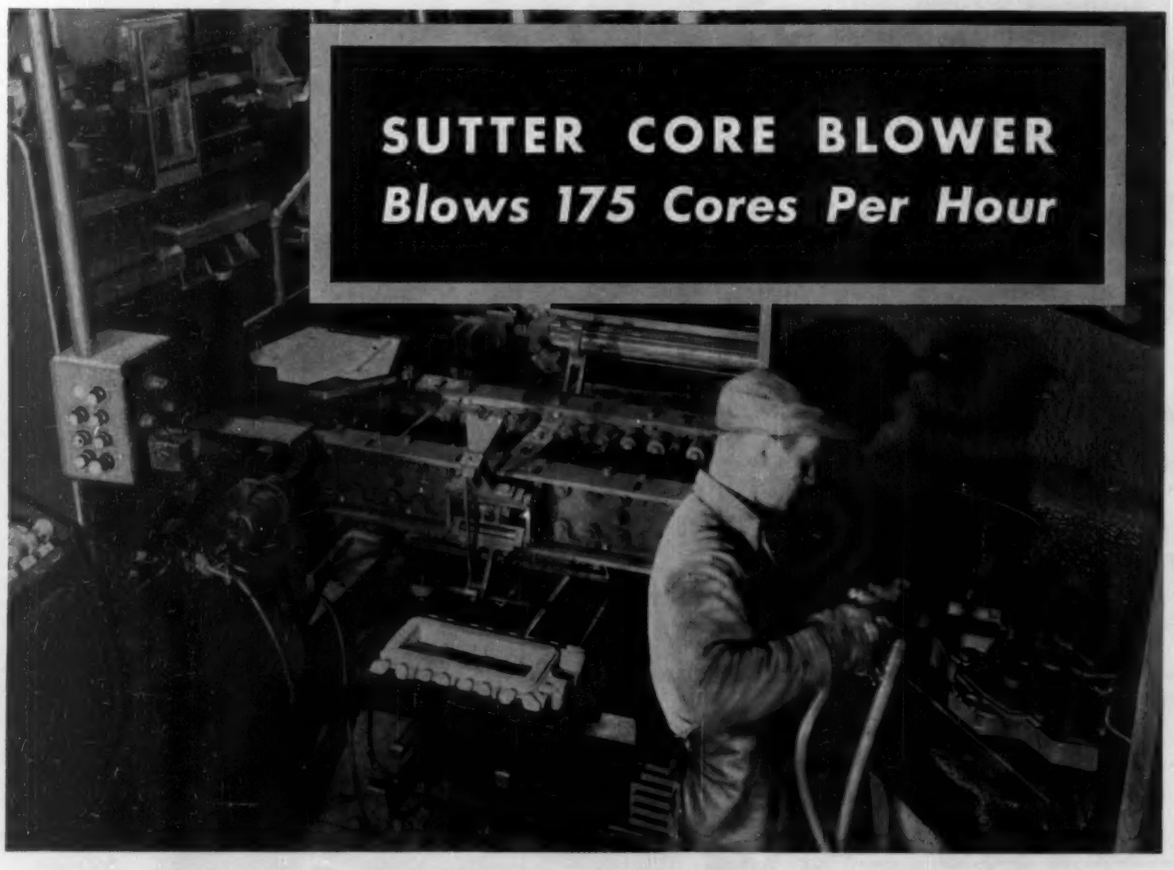
STANDARD HORSE NAIL CORP
NEW BRIGHTON, PA

CIRCLE NO. 131, PAGE 71-72



2 Different Cores . . . 2 Different Sands!

Gear Cover Core, shown in the action picture above, moving to rollover to be drawn automatically.

Tappet Housing Core. Forming this from a different sand is no problem with versatile Sutter equipment.

Here's real core blowing flexibility . . . the kind that can pay off for you in easier production scheduling and extra core output!

This Sutter Dual Head "Mechanicore" is in operation at Holmes Foundry Company, Ltd., Sarnia, Ontario. Holmes is one of Canada's leading suppliers of gray iron castings for the automotive industry. The machine blows a gear core and a tappet housing core alternately, *using a different sand for each core.* The entire cycle is automatic, requiring only unloading by the operator. This leaves him free to spray finished gear cores as shown, place them in a core rack and also set a paste-in core in the tappet housing core before placing it in a rack. Core production is 175 per hour.

The Sutter Dual Head "Mechanicore" design offers such profitable alternatives as: (1) Use both heads for the same core to increase production, (2) Maintain full production, as shown, on two different cores, (3) Use either head as a single blower to switch production quickly when needed.

Sutter builds a variety of standard model machines, also designs and builds custom units. Consult our engineers, entirely without obligation, or send for technical bulletins.

SUTTER PRODUCTS CO.
2005 WESTWOOD AVE. • DEARBORN, MICH.

SUTTER

Canadian and Overseas Mfr. & Dist'r.
Foundry Equipment Limited — Leighton Buzzard, Bedfordshire, England

CIRCLE NO. 133, PAGE 71-72

obituaries

Russell J. Anderson, director of manufacturing, Belle City Malleable Iron Co., Racine, Wis., passed away January 20 (see page 76).

James E. Crown, production superintendent, U. S. Naval Gun Factory, Washington, since 1949, died December 29 at the age of 67. Mr. Crown served as an apprentice molder,

J. E. Crown

supervisor, and master mechanic since first becoming associated with the Gun Factory more than 50 years ago. He was a past national director of AFS and was chairman of its Chesapeake Chapter in 1942-43.

Claud L. Stevens, 60, member of the quality control staff, Engine and Foundry Div., Ford Motor Co., died Wednesday, January 18.

Mr. Stevens was instrumental in developing foundry heat treat processes for Ford and in establishing metallurgical methods and standards.

His memberships are AFS, ASM, SAE and ASQC.

Lucien Beaudry, mechanical superintendent, Warden King, Ltd., Montreal, passed away January 12 at the age of 49. Mr. Beaudry was a director of the Eastern Canada Chapter of AFS from 1948 through 1951.

Elmer O. Bischoff, controller, Grede Foundries, Inc., Milwaukee, passed away January 27.

Edward Harkness, foreman of the Aluminum & Bronze Div., Textile Foundry & Machine Co., died recently.

William H. Gehring, president of Brass Products Co., Detroit, Mich., died recently at the age of 81. Mr.

Gehring was active in the foundry industry for 60 years and was one of the founders of Brass Products in 1910.

Harold W. Faint, western states sales manager, Metal Finishing Div., Frederic B. Stevens, Inc., died suddenly from a heart attack December 22.

Herman W. Nelson, 79, a pioneer in the heating and ventilating business, died January 11. He was the founder of the company which bore his name until it merged with the American Air Filter Co., Inc. in 1950.

Clifford E. Barnett, 44, production manager, Cleveland Foundry, Ford Motor Co., died November 28. Before coming with Ford in 1950, he was general foundry superintendent, Wilson Foundry & Machine Co., Pontiac, Mich.

Frank I. Schmeller, president, Schmeller Aluminum Foundry Co., Cleveland, passed away January 6 at the age of 59. Before founding the company ten years ago, Mr. Schmeller was general manager of the former National Bronze & Aluminum Co., Cleveland.

Fred A. Lange, Jr., 51, former treasurer, Crucible Steel Casting Co., Milwaukee, passed away January 2. Before coming with Crucible Steel he was associated with Eder Mfg. Co., Milwaukee.

Harold Thomas, former owner of Thomas Foundry Inc., Syracuse, New York, passed away January 6. After coming to this country from England in 1909, he spent eight years with the Lamson Corp., Syracuse.

Richard Ruemelin, Sr., 78, founder and president, Ruemelin Mfg. Co., Milwaukee, passed away December 26. He founded the business in Minneapolis in 1921 and moved it to Milwaukee in 1929.

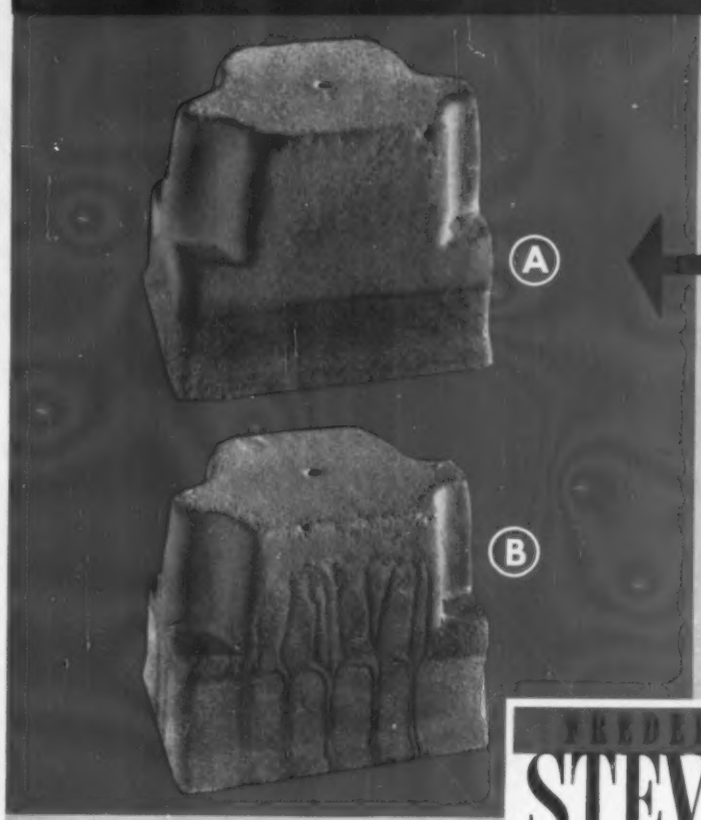
Harry E. Spieth, 69, retired manager, Western Steel Casting Co., Seattle, passed away January 1. A native of Portland, Mr. Spieth had been living in Tacoma for the past 4½ years.

William C. Epstein, Sr., 63, general manager, Miami Foundry Co., Miamisburg, Ohio, passed away November 24.

THEY'RE NEW! THEY'RE DIFFERENT!

2 NEW STEVENS CORE COATINGS

FOR BETTER CASTINGS—AT LOWER COST



STEVENS GRAPH-KOTE

A GRAPHITE CORE COATING

The unretouched illustrations at the left show (A) a core that has been dipped in the new Stevens Graph-Kote Core Coating while (B) shows another core dipped in an ordinary core coating. Observe the difference between these two coatings. Stevens Graph-Kote shows no bleed, no run-down, no tear-drops, no build-up, while the other coating shows all of these defects. The new Stevens Graph-Kote produces better castings at lower cost when used on cores and molds for grey iron, non-ferrous and alloy castings. It produces a true grey iron color on castings.

STEVENS RED-SKIN

A REFRACTORY CORE COATING

Below are shown unretouched photographs of (C) a core dipped in the new Stevens Red-Skin Core Coating and (D) a similar core dipped in a standard type carbon-free core coating. Note the difference between these coatings. Stevens Red-Skin does not run, streak, tear-drop or pile up at the edge of the core. The other coating shows inferior application. The new Stevens Red-Skin reduces costs and aids in the production of better castings when used on molds and cores for steel, grey iron and non-ferrous. It is carbon-free and is highly refractory.

FREDERIC B. STEVENS INCORPORATED EVERYTHING FOR A FOUNDRY

After months of research, formulation and testing in foundries under varied conditions, the Stevens Laboratories are proud to introduce two new and different core coatings — Stevens Graph-Kote and Stevens Red-Skin. Both have advantages to foundrymen.

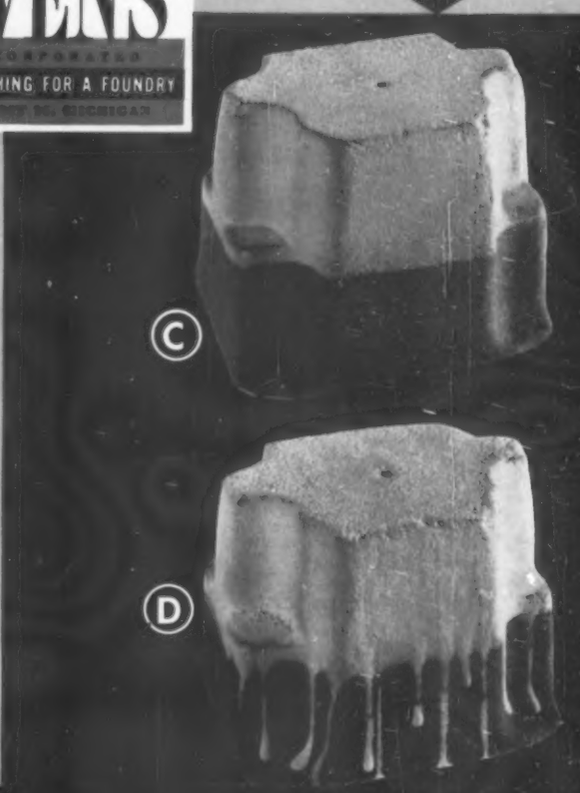
Will Reduce Labor Cost: Since both Graph-Kote and Red-Skin are "short" they coat only where a coating is needed. The dip line is sharp. No run-downs, sags, tear-drops or build-up to clean from cores. Cores can be dipped faster, core prints and assemblies fit accurately and conveyors and oven racks are kept cleaner.

Both Have Deep Penetration: For protection against metal penetration Graph-Kote and Red-Skin seal several layers of sand to insure easy peel from castings. An even, uniform coating gives ample coverage to produce clean castings.

Are Tough and Rugged: Will withstand the most severe conditions of impinging and flowing metal since the coatings are firmly anchored to mold and core surfaces and are resistant to high pouring temperatures.

Other Advantages: Stevens Graph-Kote and Red-Skin form smooth, foam-free solutions. They are ready to use, with no waiting period, as soon as they are completely mixed. Can be stored indefinitely without deteriorating in polyethylene lined containers.

To get better castings at lower cost investigate Stevens Graph-Kote and Red-Skin Core Coatings today.



BRANCHES: BUFFALO • CLEVELAND • INDIANAPOLIS • NEW HAVEN

CIRCLE NO. 134, PAGE 71-72

When you plan an electric furnace...

COMPARE COSTS PER TON OUTPUT

In these highly competitive times, we must be penny-wise *and* pound-for-pound-wise in figuring the costs of an electric furnace. Cost per ton of output is the wise way! So compute your costs by considering *all* factors! Here is why the Whiting Hydro-Arc Electric Furnace costs less *per ton of melt!*

(I) INSTALLED COST IS LESS because:

(1) the Whiting furnace foundation is simple
(2) it is completely assembled before shipment and shipped as fully assembled as practical
(3) cables are completely assembled
(4) all in-board wiring is finished and terminated at coded terminal blocks.

(II) OPERATING COST IS LESS because:

(5) electrode consumption is less
(6) electrode breakage is practically non-existent
(7) electrical energy usage for comparable operations is low
(8) top-charge, electrodes, furnace tilt and electrode clamps all operate quickly and efficiently
(9) transformer is designed to do the best job
(10) faster heats, more tons per hour

(III) MAINTENANCE COST IS LESS because:

(11) fewer working parts
(12) conveniently arranged working parts
(13) roofs are interchanged in 15 to 30 minutes
(14) refractory costs are at least 15 per cent less
(15) top-charge always in alignment
(16) all parts exposed to excessive heat are amply water-cooled
(17) smooth hydraulic operation of electrodes, furnace tilt, roof lift, and swing

So when you are buying an electric furnace, consider installation, operation and maintenance costs, quality of product and speed of operation. You'll find that Whiting melts *cost less*. Let us prove it to you. Talk things over with a Whiting Hydro-Arc Engineer!

Learn the Facts

Write today for Whiting Bulletin FY-168, which gives more complete information on how Whiting Features keep costs down, production up!

WHITING CORPORATION
15628 LATHROP AVE.
HARVEY, ILLINOIS

MEMBER FEMA

modern castings

CIRCLE NO. 135, PAGE 71-72